CERCLA Proposed Plan for Operable Unit 2 (OU2), Edwards Air Force Base, California

August 2006

The United States Air Force (Air Force) invites the public to comment on the **Proposed Plan (PP)*** for the following 11 sites and one **Area of Concern (AOC)** located within the South Base Area of Edwards Air Force Base (AFB) (Base) (Figure 1).

- *Site 5 – South Base Waste Petroleum, Oil, and Lubricants Storage Area*
- *Site 14 – South Base Fire Fighting Training Area*
- *Site 76 – Old South Base Assorted Facilities*
- *Site 86 – Building 300 Engine Test Cell*
- *Site 29 – South Base Abandoned Sanitary Landfill*
- *Site 69 – Old South Base North Landfill*
- *Site 81 – Old South Base Northern Skeet Range*
- *Site 102 – Old South Base Southern Skeet Range*
- *Site 78 – Old South Base Vehicle Maintenance Area 2*
- *Site 79 – Old South Base Vehicle Maintenance Area 1*
- *Site 96 – Old South Base Motor Pool*
- *AOC 417 – South Base Rocket Sled Track - Quarter Point Area*

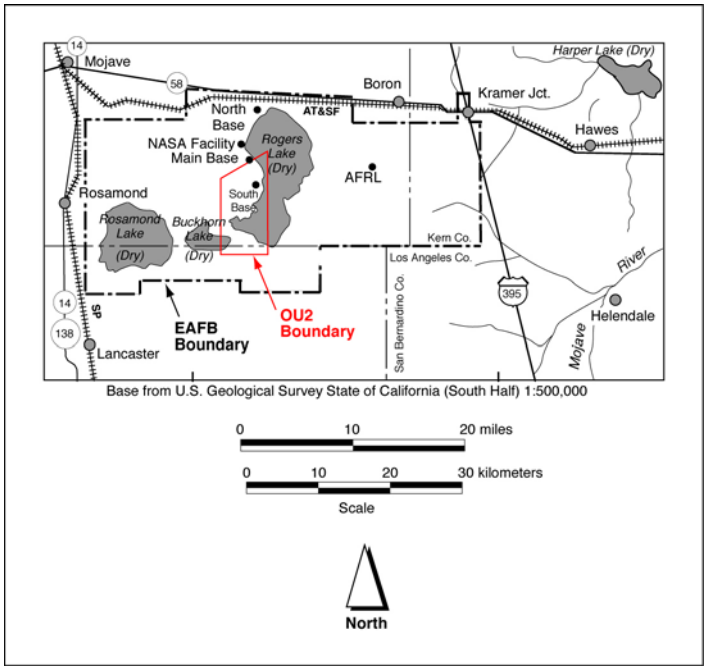

Figure 1. Edwards Air Force Base

Share Your Opinions

Your input helps the Air Force choose the best way to deal with the contamination at South Base OU2. You may fill out and mail a comment form, send an e-mail, or fax your comments to the Air Force. You may send your comments to Mr. Gary Hatch at the address, e-mail address, or fax number listed on page 37. The comment form is on page 43. Your comments must be postmarked by the last day of the comment period:

Public Comment Period: August 31, 2006, through October 2, 2006

You may also share your views by attending a public meeting. The Air Force is holding a public meeting on **September 28, 2006**, from **5:30 p.m. to 7:30 p.m.** at the **Kern County Library, Wanda Kirk Branch, 3611 Rosamond Blvd., Rosamond, CA**. There will also be a public meeting for South Base workers on **September 28, 2006,** from **12:00 p.m. to 1:30 p.m.** at the **Aero Club, Building 320, 320 Jones Road, Edwards AFB, CA**.

During these public meetings you may meet the cleanup team, ask questions, and view maps of the project. Air Force cleanup workers will give a presentation to explain their plan for cleaning up the contamination. They will also answer your questions and give you a chance to speak for the public record. Written comments will be accepted at the public meetings.

Technical terms are highlighted in* ***bold* *the first time they appear and are defined in the Glossary on pages 38-41.*

The Base Cleanup Program calls the South Base area Operable Unit 2 (OU2). OU2 consists of four distinct areas: the Old South Base **Cantonment Area**, the Landfill/Evaporation Ponds Area, the Old Hospital Area, and the South Base Sled Track Area. Sites that require cleanup are in three of the four areas; none are in the Old Hospital Area.

INTRODUCTION

This PP identifies the Preferred Alternatives for addressing the contamination at OU2. It also summarizes other alternatives evaluated for use at OU2. This PP is being issued in accordance with the public participation requirements in the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP),** 40 **Code of Federal Regulations (CFR)** Sections 300.430(f)(2) and (f)(3). This PP summarizes information found in the **Remedial Investigation (RI)** Summary Report for OU2 (October 2004), the **Feasibility Study** for OU2 (August 2005), and other documents found in the **Administrative Record File** for OU2. The Administrative Record File is maintained at the 95th Air Base Wing, Environmental Management Division, 5 East Popson Avenue, Building 2650A, Edwards AFB, California 93524-8060. In addition, copies of a subset of the data and documents contained in the Administrative Record File and a complete listing of all documents contained in the Administrative Record File are available for public review in information repositories located in the cities of Boron, Lancaster, and Rosamond, as well as Edwards AFB.

Edwards AFB was listed on the **United States Environmental Protection Agency (U.S. EPA) National Priorities List (NPL) (Superfund)** on August 30, 1990 (the NPL is the U.S. EPA's list of contaminated sites with the most potential threat to receptors). Shortly thereafter, Edwards AFB entered into a **Federal Facility Agreement (FFA)** with U.S. EPA Region 9; the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC); and the California Regional Water Quality Control Board (CRWQCB), Lahontan Region. The FFA provides the framework for involving Federal and State regulators in developing and implementing cleanup decisions.

The Air Force is working with these agencies to select final cleanup plans for OU2. For each site, the remedies proposed in this document are compared to the nine evaluation criteria established by the EPA and described in Table 1. Each remedy is then compared to the other remedies to determine which remedy is most appropriate. Details of each analysis may be found in the OU2 Feasibility Study report which is available in the Information Repositories listed at the end of this document.

The Air Force will review comments submitted during the 30-day public comment period, and will consult with the U.S. EPA and State of California regulators to determine whether or not to modify the Preferred Alternatives, or whether to select other remedies. The Air Force and U.S. EPA will jointly select the remedies for OU2, with concurrence from the State of California. At those sites in OU2 where contaminants remain on site at levels above unrestricted use levels, five-year reviews will be conducted. If a selected remedy is determined not to be successful, it may be altered accordingly.

Many of the cleanup alternatives incorporate **land use controls (LUCs)**. The Air Force already restricts public access to the sites through the use of fences, manned gates, passes, and security patrols. The Base General Plan documents the systems by which public versus restricted access is coordinated. The PP documents the locations of the LUC-restricted areas (through maps and/or narrative descriptions) and the nature of the restrictions.

Furthermore, all construction and/or digging projects on Base require approval from Environmental Management and Civil Engineering in the form of a digging permit and/or a contract by requestor permit. The program managers at Edwards AFB, or their delegates, are required to check the Edwards AFB geographic information system before approving such projects. The geographic

Table 1. Evaluation Criteria for the Comparison of Alternatives

Evaluation Criteria	Description
Threshold Criteria – Requirements that each alternative must meet to be eligible for selection	
1. Overall Protection of Human Health and the Environment.	This criterion is used to evaluate the ability of an alternative to eliminate, reduce, or control the risks associated with contaminants and exposure pathways.
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).	This criterion is used to evaluate the potential for an alternative to comply with ARARs, which are the laws and regulations applicable to the site(s).
Balancing Criteria – Used to weigh major trade-offs among alternatives	
3. Long-term Effectiveness and Permanence.	This criterion is used to evaluate the ability of an alternative to protect human health and the environment after remedial action is complete.
4. Reduction of Toxicity, Mobility, or Volume through Treatment.	This criterion is used to evaluate the ability of an alternative to eliminate or significantly reduce the toxicity, mobility, or volume of contaminants.
5. Short-term Effectiveness.	This criterion is used to evaluate the protectiveness to human health and the environment during the construction and implementation of an alternative.
6 Implementability.	This criterion is used to evaluate the technical feasibility, administrative feasibility, and availability of services and materials.
7. Cost.	Cost considerations include capital costs and present value costs. Capital costs are the costs associated with the implementation of an alternative. These include direct costs (equipment, labor, and materials for cleanup alternative implementation) and indirect costs (engineering and other costs not directly associated with construction). Present value costs are used for comparative analysis.
Modifying Criteria – Fully considered only after the public comment period for the Proposed Plan	
8. State/Support Agency Acceptance.	This criterion is used to address technical and administrative concerns that the agencies may raise during the review process.
9. Community Acceptance.	This criterion is used to evaluate the concerns that the public may have and the anticipated level of acceptance by the public.
Notes: ARAR Applicable or Relevant and Appropriate Requirement	

information system includes LUC components showing which areas of the Base are contaminated. These areas should not be disturbed without approvals from Civil Engineering and Environmental Management and proper protection, or used for unsuitable purposes (such as residential use, frequent occupancy, or tapping the **aquifer** as a drinking water source). Additional LUCs may be specified in the selected remedy where appropriate and documented in the Base General Plan.

Edwards AFB will be responsible for implementing, reviewing, and enforcing the LUCs. Edwards AFB will inspect LUCs on at least an annual basis and will report any activity found to be inconsistent with any LUC in a timely manner to the U.S. EPA and appropriate California regulators. The LUCs will remain in place until such time as contamination at each site covered by an LUC is reduced to a level at which the property may be released for unrestricted use and unlimited exposure. The Air Force will provide reasonable advance notice prior to transferring any property covered by an LUC or using such property in a manner inconsistent with the LUC.

OU2 Background – Where the Contamination is and How it Got There

Military development, operations, and activities began as early as the 1940s in the area of the current OU2. These uses are classified as industrial use. Over the years, the Air Force has used South Base as a place to train troops and test aircraft and related equipment. This has resulted in contamination from a variety of fuels and solvents, as well as solid wastes generated by these activities.

Scope and Role

The Air Force began looking for contamination at OU2 in the early 1990s. They looked at historic documents, maps, and aerial photographs, and talked to people who once worked on Base. As a result of this research, the Air Force identified a total of 64 places (called sites or "areas of concern") that may have been contaminated. These sites and areas of concern were investigated between 1993 and 2000. Workers drilled into the ground to collect soil vapor, soil, and groundwater samples. These samples were sent to off-Base laboratories to identify what chemicals were present.

Seven sites had contamination from only petroleum products such as diesel fuel and gasoline, and are not discussed in this PP. Petroleum only sites are not regulated under the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, referred to earlier as the **Superfund** statute. These sites are being cleaned up under a program that is overseen by Kern County and the State of California. Sites with both petroleum- and non-petroleum-related contaminants are regulated under CERCLA and are discussed in this PP.

Contamination that is regulated under CERCLA was found at 12 of the 64 sites and AOCs at OU2 (Figure 2), which fall into three general categories:

- Sites 5, 14, 76, and 86 are primarily focused on plumes of contaminated **groundwater**.
- Sites 29, 69, 81, and 102 contain debris that requires some form of cleanup.
- Sites 78, 79, 96, and AOC 417 are all recommended for no further action (NFA) because the contaminants have been appropriately cleaned up.

Human Health Risk Assessments

As part of the Remedial Investigation, the Air Force calculated the potential risk to human health if, in the future, people would be living or working at a site, or in the area impacted by a site. Depending upon the nature and extent of the contamination, these people could potentially be exposed to the contaminants in the soil and/or groundwater through ingestion, inhalation, or skin contact.

The calculated cancer risk estimates the probability that additional cases of cancer may develop within a population if the people are exposed to the contaminated soil or

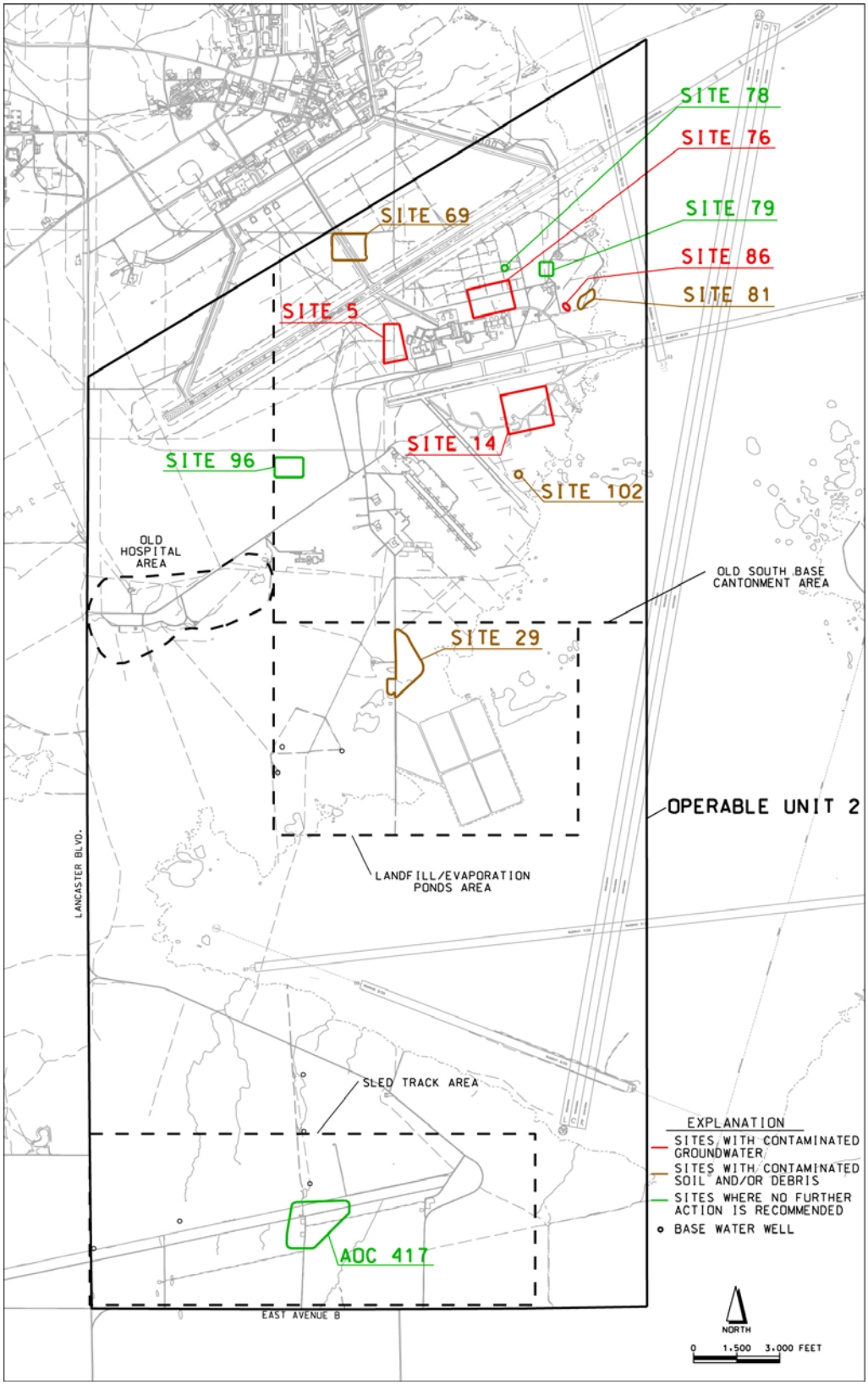

Figure 2. South Base Operable Unit 2

groundwater. For noncancer effects, a **Hazard Index** is calculated, which is a numerical expression that indicates whether the concentrations of chemicals are likely to result in specific toxic effects.

To manage the environmental risks, the U.S. EPA has developed the following ranges: more than one additional cancer case for 10,000 people is considered unacceptable; one additional cancer case for 10,000 to one million people is considered generally acceptable; and one additional cancer case for one million or more people is considered acceptable. A Hazard Index less than 1 is considered generally acceptable.

SITES WITH CONTAMINATED GROUNDWATER

Sites 5/14 Contaminant Plume

Site Background – Where the Contamination is and How it Got There

Sites 5 and 14 are located in the Old South Base Cantonment Area at OU2. Facilities within the Cantonment Area were constructed in the early 1940s and included airplane hangars, various types of shops and laboratories, personnel housing and services, underground storage tanks, and fueling systems associated with the former Muroc Army Air Base.

In the mid-1950s, operations were moved north to the newly constructed Main Base area, and a majority of the old facilities were demolished, although the underground storage tanks and pipelines were generally left in place.

Site 5 is the former South Base Waste Petroleum, Oil, and Lubricants (POL) Storage Area located along the western boundary of the Birk Flight Test Facility. At Site 5, three clusters of underground storage tanks were located at the former Fuel Oil Depot, the former Southern Fuel Depot, and the Waste POL Tanks area. The underground storage tanks were installed in the early 1940s, and were used until the mid 1950s for aviation fuel. Selected tanks were used from 1972 to 1984 for waste POL.

Site 14 is the South Base Fire Fighting Training Facility and surrounding open area located south of South Base Active Runway 06/24. Fire fighting training took place in two areas, referred to as the Former Fire Fighting Training Area and the Current Fire Fighting Training Area. Both areas were constructed in the 1960s on bare ground without containment. The former Fire Fighting Training Area has been abandoned. The Current Fire Fighting Training Area was upgraded in 1988 to include the installation of a clay cap overlain by two plastic liners, and a Fuel/Water Recovery System to prevent liquid fuel from migrating through the soil and into the groundwater. A propane-fueled fire fighting training system was later installed. No liquid fuels are currently in use at the facility.

The Air Force conducted a Site Inspection at Sites 5 and 14 between 1982 and 1989 to determine if activities at these sites had caused a contaminant release to soil or groundwater. The studies included conducting soil gas surveys, drilling and sampling soil boreholes, and installing and sampling groundwater **monitoring wells**. The sites were determined to require remedial investigation to *further* define the nature and extent of the soil and groundwater contamination. Soil and groundwater were sampled between 1993 and 1996, and studies were also conducted from 1999 to 2000 to determine the nature and extent of **free-product** (a portion of the fuel/solvent mixture that floats on the groundwater).

Site Characteristics

Fuels and waste solvents placed in the underground storage tanks at Site 5 leaked into the soil, and subsequently reached the groundwater, which occurs at a depth of approximately 55 feet below ground surface. The groundwater contaminants occur in two phases: free-product and dissolved phase, with the floating free-product acting as a continuing source of contamination to the dissolved phase as contaminants continue to slowly dissolve into the groundwater. The dissolved phase plume extends to the southeast for approximately 5,600 feet to Site 14 (Figure 3). The entire

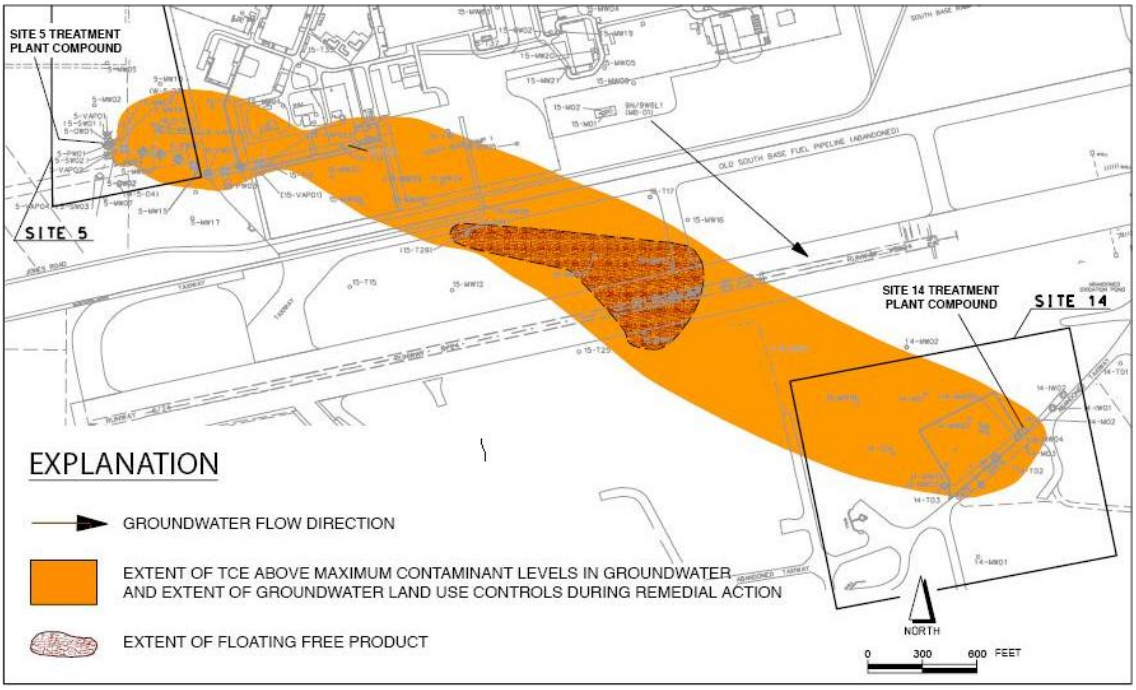

Figure 3. The Sites 5/14 Contaminant Plume

volume of contaminated groundwater has been named the Sites 5/14 **Contaminant Plume**. Although groundwater in the Sites 5 and 14 areas is not currently used for drinking water, historic (inactive) Base supply wells are located within the boundaries of the sites. Active Base supply wells are located approximately two miles south of the sites (see Figure 2). The State of California has designated the groundwater at these sites to be within the drinking water basin for the Antelope Valley. The findings of the Remedial Investigation are available for review in the Operable Unit 2 Remedial Investigation Summary Report located at the Information Repositories listed at the end of this document.

What the Air Force Has Already Done to Clean Up the Site

The Air Force has already performed some cleanup at these sites to remove the possible sources of contamination and to treat the contaminated soil and groundwater.

- Twenty-two underground storage tanks and their contents were removed from Site 5 between November 1993 and April 1994. Liquids contained in the underground storage tanks were pumped off and taken to a recycling center. The tanks were decontaminated and disposed off Base at a recycling facility. No underground storage tanks currently remain in the ground at the site.
- In the areas with only fuel contamination in the soil, two treatment systems were installed (under a separate leaking underground fuel tank program overseen by Kern County) that clean the soil by providing air to bacteria that naturally occur in the soil at Edwards AFB. The bacteria are capable of digesting the fuel contamination. These systems pipe air into the soil using a blower in a process called bioventing. One **bioventing system** was operated from 1995 to 1996, and was shut down after the soil was cleaned. A second system started up in 1999 in a different area of soil contamination and has recently been shut down pending closure by Kern County.

- In 1996, a document known as an engineering evaluation/cost analysis (EE/CA) was prepared to look at different ways to clean the soil and groundwater in the source area of the Sites 5/14 Contaminant Plume. A **dual extraction system (DES)** was built in 1997 to treat the Sites 5/14 Contaminant Plume. The DES continues to operate and to date has cleaned over 2 billion cubic feet of soil vapor and 75 million gallons of groundwater. Over five hundred thousand pounds of contaminants have been destroyed.
- An underground storage tank associated with an oil-water separator was removed from Site 14 in February 1997. The tank and associated piping were taken to an off-Base recycling facility. Approximately 925 cubic yards of fuel-contaminated soil were removed from the site and cleaned by an on-Base biological treatment system.
- In November 1997, an EE/CA was prepared to look at different ways to clean the groundwater at Site 14, and prevent the Sites 5/14 Contaminant Plume from traveling farther. It was determined that migration of the Sites 5/14 Contaminant Plume could be prevented by extracting the groundwater at the leading edge of the plume with a series of wells (referred to as a "barrier well system"). The extracted groundwater would be cleaned with granular activated carbon and re-injected back into the aquifer. This **groundwater extraction and treatment system (GETS)** was built in 1998 and is still operating. To date, the system has treated over 17 million gallons of groundwater and removed over 15 pounds of solvents.
- In addition to the GETS, the installation of a bioventing system was recommended to clean soils contaminated by fuels that leaked from an underground storage tank at Site 14. The bioventing system installed in 2000 has recently been shut down pending closure by Kern County.
- Between April and November 2005, **pilot tests** were performed to evaluate **in situ bioremediation** using the PHOSter technology. The technology includes the injection of air, gaseous nutrients (nitrogen and phosphorous), and methane into the groundwater to stimulate bacteria that break down the contaminants. One test was performed at Site 5 to evaluate whether the technology could remediate both free-product and dissolved contaminants in the Sites 5/14 Contaminant Plume. A second test was performed at Site 14 to evaluate whether the technology could clean the **trichloroethene (TCE)**-only portion of the plume. The results of the pilot tests indicated that in situ biological degradation of the fuels and solvents in the groundwater and free-product at Sites 5 and 14 using the PHOSter technology is feasible.

Remaining Contamination at Sites 5 and 14

The treatment systems at Sites 5 and 14 were designed to target the source area of the plume, and prevent the plume from migrating farther. The systems have been successful in doing this. Samples were collected from the soils overlying the Sites 5/14 Contaminant Plume in March 2004 to check the status of the cleanup. Although some low levels of fuel and solvent constituents were still present in the soils at Sites 5 and 14, no individual contaminant was detected at levels that would pose a risk to human health of hypothetical future residents or the environment (see discussion in Summary of Site Risks section).

However, contamination still remains in the groundwater at the sites. The underground contaminant plume extending from Site 5 to Site 14 covers an area of approximately 87 acres. The total estimated volume of groundwater in the plume that is potentially contaminated above **Maximum Contaminant Levels (MCLs)** (drinking water standards) is 85 million gallons. All of the contaminated groundwater contains solvent components, primarily TCE (Table 2). An estimated 30 percent of the groundwater is also contaminated with fuel components. Free-product floating on top of the underground contaminant plume covers an area of approximately 11 acres. The estimated volume of floating free-product is 119,000 gallons.

Table 2. Contaminants of Concern in the Groundwater and Free-product at Sites 5/14

Contaminant	Highest Level Detected in 2004 (µg/L)	MCL (µg/L)	Background Level at OU2 (µg/L)	Cancer Causing?
Groundwater				
Volatile Organics				
Carbon tetrachloride	1.8	0.5	NA	Probable
1,2-Dichloroethane	1.4[a]	0.5	NA	Probable
Cis-1,2-dichloroethene	14	6	NA	Probable
Ethylene dibromide (EDB)	0.94	0.05	NA	Probable
Trichloroethene (TCE)	390	5	NA	Probable
Contaminant	Highest Level Detected[b] (µg/L)	MCL (µg/L)	Background Level at OU2 (µg/L)	Cancer Causing?
Free-product				
Total Extractable Petroleum Hydrocarbons				
Jet fuel #4	1,900,000 mg/L	None	NA	NA
Total Volatile Petroleum Hydrocarbons				
Unknown Volatile Hydrocarbons[c]	660,000 mg/L	None	NA	NA
Volatile Organics				
Sec-butylbenzene	370,000	None	NA	NC
Ethylbenzene	510,000	300	NA	NC
Isopropylbenzene	500,000	None	NA	NC
P-isopropyltoluene	640,000	None	NA	NA
N-propylbenzene	550,000	None	NA	NC
Trichloroethene (TCE)	220,000	5	NA	Probable
1,2,4-Trimethylbenzene	3,600,000	None	NA	NC
1,3,5-Trimethylbenzene	1,400,000	None	NA	NC
M- & p-xylene	550,000	1,750	NA	NC
O-xylene	93,000	1,750	NA	NC
Semivolatile Organics				
Naphthalene	510,000	None	NA	NC

Notes:

[a] Estimated concentration below the laboratory reporting limit.

[b] All free-product data are estimated concentrations below the laboratory reporting limit. The laboratory diluted the samples up to 10,000 times to obtain results.

[c] Weathered gasoline fraction.

NA Not applicable

NC Noncarcinogenic

This table shows the contaminants of concern found in the groundwater at Sites 5/14 at concentrations that are higher than the safe limits set in the Safe Drinking Water Act. The Safe Drinking Water Act calls the safe limits Maximum Contaminant Levels, or MCLs. The MCL shown is the more stringent of the State of California or Federal MCL.

This table also shows the contaminants found in the free-product, which floats on top of the groundwater, in the middle portion of the plume.

The symbol µg/L means micrograms per liter, approximately the same as parts per billion. It is the unit of measure used to track contamination in groundwater. One microgram per liter is equal to one part contamination and 999,999,999 parts water. The symbol mg/L means milligrams per liter, approximately the same as parts per million, which is equal to one part contamination and 999,999 parts water.

Summary of Site Risks

Human Health Risk

A very conservative (i.e., health-protective) risk assessment was conducted that hypothetically assumed people would be living and/or working at Sites 5 and 14 in the future. These people would potentially be exposed to the contaminants in the soil and groundwater through ingestion, inhalation, or skin contact.

The cancer risk to hypothetical future residents who could potentially be exposed to contaminated soils at Site 5 is calculated at $6x10^{-7}$, or about six additional cancer cases for ten million people exposed, which is considered acceptable. The noncancer Hazard Index for hypothetical future residents who could potentially be exposed to contaminated soil at Site 5 is 2.0, which is considered unacceptable. The noncancer Hazard Index is driven by low levels of a variety of contaminants and assumes direct contact with soil. None of the constituents in the soil were detected above residential **preliminary remediation goals (PRGs)**. The cumulative effect of individual constituents pushed the noncancer Hazard Index above 1. In addition, it should be noted that the contaminated soils are located at depths greater than 20 feet below ground surface, making residential exposure unlikely.

The cancer risk to industrial workers who could potentially be exposed to contaminated soils at Site 5 is calculated at $2x10^{-7}$, or about two additional cancer cases for ten million people exposed, which is considered acceptable. The noncancer Hazard Index for industrial workers exposed to contaminated soil at Site 5 is 0.60, which is considered acceptable.

The cancer risk to hypothetical future residents who could potentially be exposed to contaminated soils at Site 14 is calculated at $6x10^{-7}$, or about six additional cancer cases for ten million people exposed, which is considered acceptable. The noncancer Hazard Index for hypothetical future residents exposed to contaminated soil at Site 14 is 0.81, which is considered acceptable.

The cancer risk to industrial workers who could potentially be exposed to contaminated soils at Site 14 is calculated at $2x10^{-7}$, or about two additional cancer cases for ten million people exposed, which is considered acceptable. The noncancer Hazard Index for industrial workers exposed to contaminated soil at Site 14 is 0.34, which is considered acceptable.

The cancer risk to hypothetical future residents who could potentially be exposed to contaminated groundwater in the Sites 5/14 Contaminant Plume is calculated at $4x10^{-4}$, or about four additional cancer cases for ten thousand people exposed, which is considered unacceptable. The noncancer Hazard Index for hypothetical future residents who could potentially be exposed to contaminated groundwater in the Sites 5/14 Contaminant Plume is 0.62, which is considered acceptable.

The cancer and noncancer risks to industrial workers from the groundwater in the Sites 5/14 Contaminant Plume were not evaluated. Workers are not likely to contact the groundwater through routine activities.

At Building 120, located within the limits of the contaminant plume, the cancer risk to industrial workers exposed to potentially contaminated indoor air (vapor intrusion) is calculated at $7x10^{-8}$, or about seven additional cancer cases for 100 million people exposed, which is considered acceptable. The Hazard Index for industrial workers exposed to potentially contaminated indoor air is 0.079, which is considered acceptable.

Ecological Risk

Technical experts completed ecological risk assessments at Sites 5 and 14. They found that the contamination is too deep to pose a risk to wildlife or habitat. In addition, the industrial nature of these sites makes for poor wildlife habitat, and no threatened or endangered plants or animals live at these sites.

No Further Action for Soil

The Air Force, U.S. EPA, and State of California agree that "no further action" is the appropriate remedy for soils at these sites. The cancer risk to humans is acceptable to hypothetical future residents, and there is no risk to wildlife or habitat. Although the noncancer risk to hypothetical future residents was calculated as unacceptable, the risk is likely overstated because the contamination is deep and levels of contamination are relatively low. None of the constituents in the soil were above residential PRGs.

Cleanup Goals for Groundwater

It is the Air Force's current judgment that the Preferred Alternative identified in this PP, or one of the other active measures considered in this PP, is necessary to protect public health or welfare and the environment from contaminants in groundwater.

The team evaluating long-range remedial objectives for the contamination at Sites 5 and 14 has put together several goals or **remedial action objectives (RAOs)** for cleaning up the groundwater. The RAOs are to reduce to acceptable levels the risk associated with the contaminants identified during the Remedial Investigation and include:

- Protecting people's health by preventing exposure to groundwater contaminants that pose an unacceptable cancer risk as defined by the U.S. EPA
- Preventing or minimizing further migration of the contaminant plume, including the further migration of contaminants from free-product to groundwater
- Reducing levels of contaminants in groundwater to safe drinking water standards, if practicable.

The MCLs for the contaminants listed in Table 2 that were established under the Safe Drinking Water Act, are relevant and appropriate cleanup goals for a protective cleanup of groundwater at these sites and are **Applicable or Relevant and Appropriate Requirements (ARARs)** for this cleanup.

Summary of Remedial Alternatives

The Air Force is looking at four different ways to manage and clean up the contaminated groundwater to protect people and wildlife, and the future use of the groundwater. As required by the NCP [40 CFR 300.430(e)(9)(iii)], the cleanup team compared each alternative against the nine criteria detailed in Table 1. Alternative 4, In Situ Treatment, is preferred. The OU2 Feasibility Study, completed in August 2005, provides more detail.

The four possible alternatives are:

1. No Action. This alternative is listed only to compare to other alternatives. No action would be taken, no monitoring would be performed, and the contamination would remain in place. Bacteria present in the groundwater would slowly reduce (i.e., degrade) the concentrations of some of the fuels. This alternative would cost nothing (Table 3).

2. Containment and Land Use Controls (LUCs). This alternative consists of the continued operation of the Site 14 GETS (i.e., barrier well system) to prevent further migration of the plume. The Site 5 DES would be shut down. Groundwater samples would be collected and analyzed to make sure the Site 14 GETS was stopping the plume from migrating, and to see how fast the contaminants were degrading naturally through physical, chemical, or biological mechanisms. LUCs would also be put in place to prevent people from using the groundwater. Procedures to maintain LUCs would be documented in the Base General Plan. Based on computer modeling, the Site 14 GETS would need to be operated for an estimated 100 years. This alternative would cost an estimated $30 million over 100 years (Table 3).

3. Source Removal, Containment, and LUCs. As in Alternative 2, the Site 14 GETS would be operated for plume containment. The Site 5 DES would be shut down. A system

Table 3. Costs of the Sites 5/14 Alternatives

Cost in 2007 dollars	Alternative 1	Alternative 2	Alternative 3	Alternative 4		
				a	b	c
Timeframe	NA	100 years	30 years	21 years	12 years	12 years
Capital	$0	$33,700	$4,900,000	$7,490,000	$3,910,000	$7,830,000
LUCs/LTM	-	$3,810,000	$1,740,000	$1,220,000	$697,000	$697,000
Operation & Maintenance	-	$8,850,000	$7,980,000	$6,500,000	$2,040,000	$6,130,000
Escalated Cost(1)	$0	$29,500,000	$17,600,000	$17,600,000	$7,280,000	$16,100,000
Present Value Cost(2)	$0	$3,050,000	$11,600,000	$12,800,000	$6,040,000	$13,200,000

Notes:
(1) Escalated cost is the inflationary adjustment from current dollars to the future estimated cost when the work is performed.
(2) Present value is the amount of money that would need to be invested in the present to cover the total cost of the project, assuming an interest rate of 7 percent.
LTM Long-term monitoring
LUCs Land use controls

As recommended by the U.S. EPA, cost estimates for each alternative are to be within an accuracy range of –30 to +50 percent. The complete cost estimates can be found in the OU2 Feasibility Study.

similar to the Site 5 DES would be constructed to remove the remaining source of groundwater contamination, which is the floating free-product in the middle of the plume (see Figure 3). The new system would be much larger than the current system because it would need to support approximately 60 **extraction wells**. After the source of the contamination is removed, the plume would be allowed to degrade naturally. Groundwater samples would be collected and analyzed to see how fast the contaminants were degrading naturally through physical, chemical, or biological processes. LUCs would also be put in place to prevent people from using the groundwater during cleanup. Procedures to maintain LUCs would be documented in the Base General Plan. The Site 5 DES has proven the technology is effective in removing floating free-product. This alternative would cost an estimated $18 million over 30 years (Table 3).

4. In Situ Treatment. In situ treatment methods clean the groundwater while it is in the aquifer, rather than pumping it out to clean it. The Air Force looked at several different in situ treatment methods to clean the entire Sites 5/14 Contaminant Plume to safe drinking water standards.

One method would be to inject air and nutrients into the groundwater to stimulate the bacteria that eat the contaminants, known as **aerobic biological degradation** because the bacteria grow in the presence of oxygen. This method works best with fuels, but can also work with TCE.

Another method, known as "**in situ chemical oxidation" (ISCO),** would be to inject chemicals into the groundwater to destroy the contaminants. This method carries certain safety risks because most chemicals capable of destroying fuels react violently with the contaminants in the groundwater. The Air Force, after looking at different chemicals to decide which one would work best on the contamination at Sites 5 and 14, selected **permanganate**, a chemical capable of destroying TCE without reacting violently with fuels. Also, permanganate does not degrade rapidly in groundwater, so it can clean groundwater several hundred feet from where it is injected. This means fewer injection wells would need to be installed, which would save money and be less disruptive to the current work activities at South Base.

Pilot testing conducted in 2005 has shown that aerobic biological degradation of the fuels and solvents in the groundwater and the free-product at Sites 5 and 14 is feasible. Although ISCO using permanganate has been tested at other sites, it has not been tested at Sites 5 and 14. The Air Force would have to conduct a small-scale "pilot" test to make sure the technique works before putting in a full-scale system. LUCs would be put in-place to prevent people from using the groundwater during cleanup. Groundwater samples would be collected and analyzed to see how fast the contaminants were degrading. Also, maintenance of the containment system described in Alternative 2 would be required.

The Air Force looked at three different sub-alternatives that combine the ways these technologies could be used to clean the entire plume. For all sub-alternatives, the DES at Site 5 would be shut down and the GETS at Site 14 would remain in operation until cleanup goals are obtained.

a) Aerobic Biological Degradation of the Entire Plume. Air and nutrients would be injected into the groundwater. It would require an estimated 480 wells and 21 years to clean the plume, at an estimated cost of $18 million (Table 3).

b) Aerobic Biological Degradation of the Source Area and ISCO of the Dissolved Chlorinated Plume (Preferred Alternative). Air and nutrients would be injected into the groundwater only in areas with floating free-product. An estimated 60 wells would be required. Permanganate would be injected into the groundwater, where dissolved phase contaminants are present, through an estimated 10 horizontal wells. This alternative would cost an estimated $7 million over 12 years (Table 3).

c) Free-product Recovery with Dual Extraction Wells and ISCO of the Dissolved Chlorinated Plume. This sub-alternative is like 4b in that it uses ISCO to destroy contaminants. Additionally, the DES system described in Alternative 3 would be used in areas with floating free-product. This alternative would cost an estimated $16 million over 12 years (Table 3).

Comparing the Alternatives to Cleanup Requirements

The Air Force evaluates nine criteria established by the U.S. EPA (see Table 1) when choosing a way to clean up a contaminated site. The four alternatives and three sub-alternatives previously mentioned are compared against the nine criteria in Table 4.

Alternative 4, Sub-Alternative b is Preferred

Based on an evaluation of the remedial alternatives against the nine criteria listed in Table 1, Alternative 4, Sub-Alternative b, Aerobic Biological Degradation of the Source Area and ISCO of the Dissolved Chlorinated Plume is preferred as the proper course of action to address the groundwater contamination at Sites 5 and 14. This alternative is preferred because it will clean the contamination, will reduce the risk to human health, and is protective of the environment. It is also the lowest cost alternative that will clean the entire plume.

The Air Force will still need to conduct pilot tests to make sure this alternative will work. If the pilot tests show it will not work, the Site 14 GETS will continue to be operated to make sure the plume does not grow bigger. The free-product in the middle of the plume will be pumped out so it will not continue to contaminate the groundwater while an alternative remedy is selected and implemented.

If the preferred alternative is implemented based on pilot testing, full-scale system performance will be evaluated. Because the preferred alternative will result in contaminants remaining on-site at levels above unrestricted use levels, five-year reviews will be performed until such time as contaminants are reduced to unrestricted use levels. Also, the groundwater at Sites 5 and 14 will be subject to LUCs that would prevent use of, or unprotected contact with, the groundwater at these sites, until such time as contamination is reduced to a level at which the

Table 4. Evaluation of Alternatives for the Groundwater Sites

KEY

○ Does not meet criteria
◒ Partially meets criteria
● Meets Criteria

Evaluation Criteria	Overall protection of human health and the environment	Compliance with ARARs	Long-term effectiveness and permanence	Reduction of toxicity, mobility, or volume through treatment	Short-term effectiveness	Implementability	Cost	State/Support Agency acceptance	Community acceptance
Sites 5/14 Alternatives									
1. No Action	○	○	○	○	●	●	●	○	TBD
2. Containment and LUCs	●	◒	◒	◒	●	●	○	○	TBD
3. Source Removal, Containment, and LUCs	●	◒	◒	●	◒	◒	◒	●	TBD
4. In Situ Treatment									
a) Aerobic Biological Degradation of Entire Plume	●	●	●	●	◒	◒	◒	●	TBD
b) Aerobic Biological Degradation of Source Area, ISCO of the Dissolved Chlorinated Plume (Preferred Alternative)	●	●	●	●	◒	◒	●	●	TBD
c) Free-product Recovery with Dual Extraction Wells, ISCO of the Dissolved Chlorinated Plume	●	●	●	●	◒	◒	◒	●	TBD
Sites 76 and 86 Alternatives									
1. No Action	○	○	○	○	●	●	●	○	TBD
2. LUCs and Long-term Monitoring	●	○	◒	○	●	●	◒	○	TBD
3. Active Groundwater Restoration (**Ex Situ** Treatment)	●	●	●	●	◒	●	◒	●	TBD
4. Active Groundwater Restoration (In Situ Treatment) (Preferred Alternative)									
a) Anaerobic Biological Degradation	●	●	●	●	◒	◒	◒	●	TBD
b) ISCO	●	●	●	●	◒	◒	●	●	TBD

Notes:

ISCO In situ chemical oxidation

LUCs Land use controls – LUCs are a component of all alternatives except Alternative 1 (No Action)

TBD to be determined, community acceptance will be assessed at the end of the public review and comment period

property could be released for unrestricted use and unlimited exposure.

Sites 76 and 86 Contaminant Plumes

Site Background – Where the Contamination is and How it Got There

Site 76, Old South Base Assorted Facilities, is located northeast of the Birk Flight Test Facility and includes the northeastern portion of that facility. The site consists of remnants of a Vehicle Maintenance Area; a Motor Repair Shop; an Engineering Shop; a Maintenance/ Inspection Facility; a Utility Shop; a Gas Station; a Fire Station; Paint, Oil, and Dope Buildings; a Turret Building; and three underground storage tanks. The facilities were active from 1942 possibly until the early 1950s. The contents of the underground storage tank associated with the Old South Base Engineering Shop, its integrity, and the details of its removal are not known. The underground storage tank associated with Old South Base Gas Station 2 probably contained leaded gasoline. The underground storage tank associated with the Turret Training Building held fuel oil.

Site 86, Building 300 Engine Test Cell, is located southeast of Building 300 and consists of a former engine test cell that was constructed in the late 1940s (post World War II) and was likely active into the 1950s. Only concrete foundations of the former facilities remain. Fuels, solvents, and waste oils and lubricants may have been used and disposed at this facility. Several unlined surface drainage channels lead away from the test cell. Cooling water contaminated with petroleum products and solvents (primarily TCE) may have been flushed through the engines, and discharged to the surrounding soil via the drainage channels.

Site Characteristics

Workers drilled into the ground to collect soil and groundwater samples. These samples were sent to off-Base laboratories to see what chemicals were present. No organic contamination above regulatory guidelines and no inorganic constituents above background concentrations were found in soils at either site. The findings of the Remedial Investigation are available for review in the Operable Unit 2 Remedial Investigation Summary Report located at the Information Repositories listed at the end of this document.

However, contamination from equipment cleaning with solvents (TCE) at Site 76 and from engine flushing with solvents (TCE) at Site 86 leaked into the groundwater (Table 5), which occurs at depths of approximately 52 feet and 45 feet below ground surface at the two sites, respectively. The contamination in the groundwater at Sites 76 and 86 is limited to the upper 10 feet to 15 feet of the aquifer. At Site 76, TCE concentrations are localized in an area approximately 100 feet wide by 400 feet long (Figure 4). The plume covers groundwater. At Site 86, TCE concentrations are localized in an area approximately 200 feet wide by 700 feet long (Figure 5). The plume covers approximately 2.6 acres. There are approximately 2.6 million gallons of contaminated groundwater. There is evidence that the plumes are migrating based on historical data. There is no known source for the cadmium and nickel that were detected in the groundwater above background levels at Site 86; therefore, it is likely that these metals are naturally occurring.

What the Air Force Has Already Done to Clean the Site

Two underground storage tanks and their contents were removed from Site 76 in May 1995. The tanks were decontaminated and disposed off-Base at a recycling facility. No underground storage tanks or soil contamination remain at the site.

Due to the low risk to human health and the environment from the groundwater contamination at Sites 76 and 86, only groundwater monitoring and LUCs have been instituted to date. These LUCs consist of requiring digging permits for intrusive work, and prohibiting people from drinking the groundwater at the sites.

Table 5. Contaminants of Concern in the Groundwater at Sites 76 and 86

Contaminant	Highest Level Detected in 2004 (µg/L)	MCL (µg/L)	Background Level at OU2 (µg/L)	Cancer Causing?
Site 76				
Volatile Organics				
Trichloroethene (TCE)	17	5	NA	Probable
Site 86				
Volatile Organics				
Trichloroethene (TCE)	230[(a)]	5	NA	Probable
Metals				
Cadmium	0.0083 mg/L[(b)]	0.005 mg/L	0.005 mg/L	Probable
Nickel	0.59 mg/L[(b)]	0.1 mg/L	0.04 mg/L	Probable

Notes:

(a) The well located in the highest concentration area was last sampled in May 2003.

(b) Contaminant levels included in this table are greater than both the MCLs and background levels, when applicable, at OU2.

NA Not applicable

This table shows the contaminants of concern found in the groundwater at Sites 76 and 86 at concentrations that are higher than the safe limits set in the Safe Drinking Water Act. The Safe Drinking Water Act calls the safe limits Maximum Contaminant Levels, or MCLs. The MCL shown is the more stringent of the State of California or Federal MCL.

The symbol µg/L means micrograms per liter, approximately the same as parts per billion. It is the unit of measure used to track contamination in groundwater. One microgram per liter is equal to one part contamination and 999,999,999 parts water. The symbol mg/L means milligrams per liter, approximately the same as parts per million, which is equal to one part contamination per 999,999 parts water.

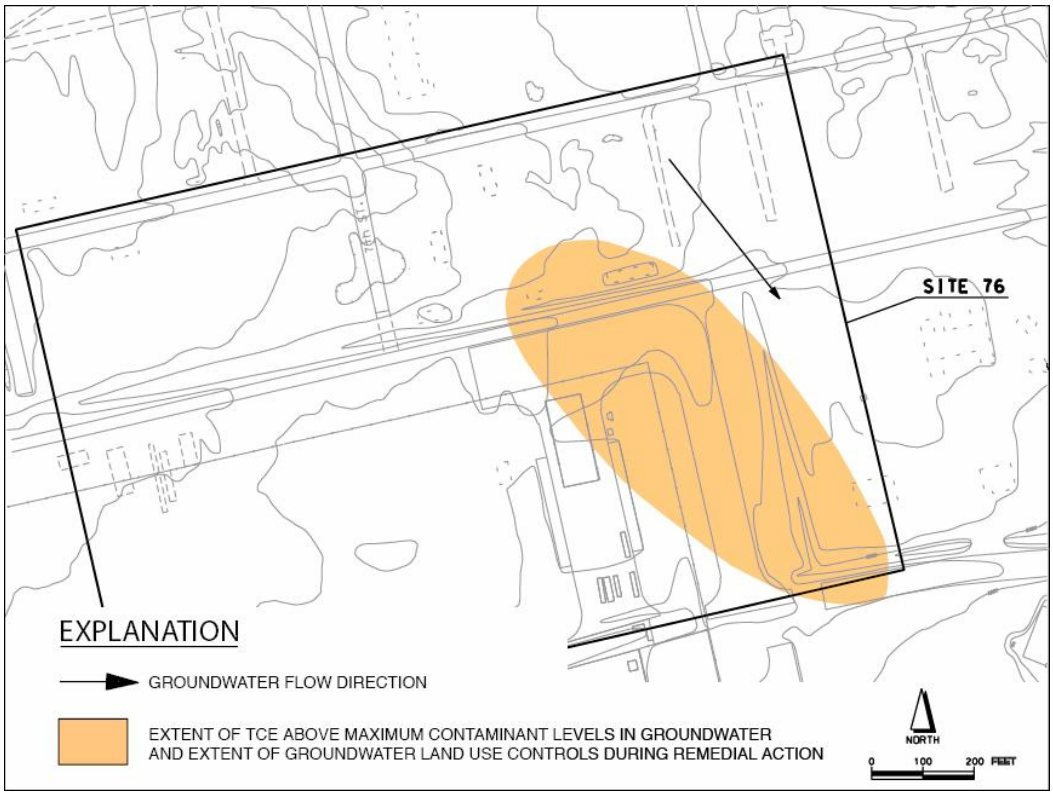

Figure 4. The Site 76 Contaminant Plume

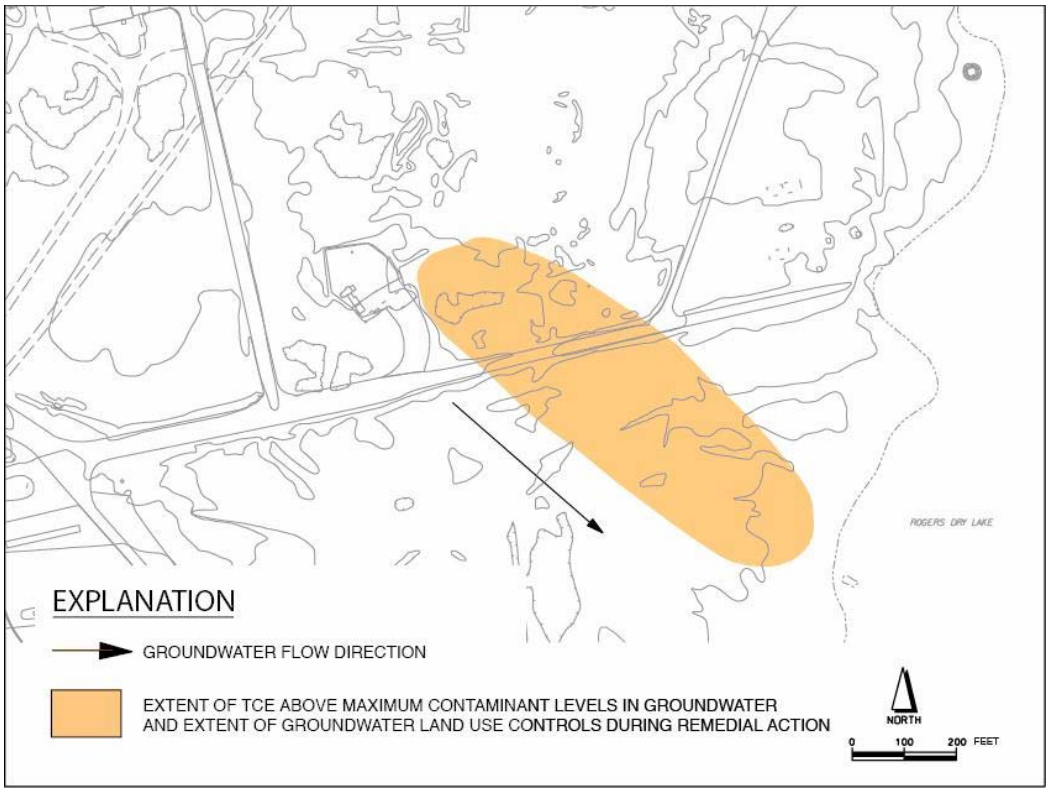

Figure 5. The Site 86 Contaminant Plume

Summary of Site Risks

Human Health Risk

A very conservative (i.e., health-protective) risk assessment was conducted that hypothetically assumed people would be living and/or working at Sites 76 and 86 in the future. These people would potentially be exposed to the contaminants in the soil and groundwater through ingestion, inhalation, or skin contact.

There is no cancer risk for hypothetical future residents or industrial workers exposed to soils at Site 76.

The cancer risk for hypothetical future residents exposed to soils at Site 86 is $7x10^{-8}$ or about seven additional cancer cases for 100 million people exposed. The cancer risk for industrial workers exposed to soils at Site 86 is calculated at $3x10^{-8}$, or about three additional cancer cases for 100 million people exposed. Both the residential and industrial cancer risks at Site 86 are considered acceptable.

The Hazard Indices for hypothetical future residents exposed to soils at Sites 76 and 86 are 0.012 and 0.005 respectively, which are considered acceptable.

The Hazard Indices for industrial workers exposed to soils at Sites 76 and 86 are less than 0.001, and are considered acceptable.

The cancer risk to hypothetical future residents exposed to groundwater at Site 76 is $6x10^{-5}$, or about six additional cancer cases for 100,000 people, which is considered generally acceptable**.** The cancer risk to hypothetical future residents exposed to groundwater at Site 86 is $2x10^{-4}$, or about two additional cancer cases for 10,000 people, which is considered unacceptable because it is above the generally acceptable risk range. The cancer and noncancer risk to industrial workers from the groundwater at Sites 76 and 86 was not evaluated. Workers are not likely to contact the groundwater through routine activities.

The cancer risk to industrial workers exposed to potentially contaminated indoor air at Site 76 is calculated at $1x10^{-8}$, or about one additional cancer case for 100 million people exposed, which is considered acceptable. The Hazard Index for industrial workers exposed to potentially contaminated indoor air is less than 0.001, which is considered acceptable. No risk from potentially contaminated indoor air was calculated for Site 86 because there are no buildings at the site.

Ecological Risk

Technical experts completed ecological risk assessments at Sites 76 and 86. They found that the groundwater contamination is too deep to pose a risk to wildlife and habitat, and that there was no risk from soils. The industrial nature of these sites makes for poor wildlife habitat, and no threatened or endangered plants or animals live at these sites.

No Further Action for Soil

The Air Force, U.S. EPA, and State of California agree that No Further Action is required for the soil at Sites 76 and 86 because the cancer and noncancer risks to humans are acceptable for both residential and industrial users, and there is no risk to wildlife and habitat.

Cleanup Goals for Groundwater

It is the Air Force's current judgment that the Preferred Alternative identified in this PP, or one of the other active measures considered in this PP, is necessary to protect public health or welfare and the environment from contaminants in groundwater.

RAOs for cleaning up the groundwater were developed. The RAOs are to reduce to acceptable levels the risk associated with contaminants identified during the Remedial Investigation and include:

- Protecting people's health by preventing exposure to groundwater contaminants that pose an unacceptable cancer risk as defined by the U.S. EPA
- Preventing or minimizing further migration of the contaminant plume
- Reducing levels of contaminants in groundwater to safe drinking water standards, if practicable.

The MCL for TCE that is established under the Safe Drinking Water Act is relevant and appropriate for establishing the protective cleanup goal for the groundwater.

Summary of Remedial Alternatives

The Air Force is looking at four different ways to manage and clean up the contaminated groundwater to protect people and wildlife, and the future use of the groundwater. The cleanup team compared each alternative against the nine criteria as detailed in Table 1. Alternative 4, Active Groundwater Restoration (In Situ Treatment), is preferred for both sites. The OU2 Feasibility Study, completed in August 2005, provides more detail.

The four possible alternatives are:

1. No Action. This alternative is listed only to compare to other alternatives. Nothing would be done, and the contamination would remain in place. Bacteria present in the groundwater may slowly degrade some of the contaminants. This alternative would cost nothing (Table 6).

2. Land Use Controls and Long-term Monitoring. This alternative consists of sampling and analyzing the groundwater at each site to make sure that the plumes are not moving, and to see if the contaminants are degrading. The Air Force would maintain LUCs to make sure people do not use the groundwater. The alternative assumes that sampling would occur at two monitoring wells at each site annually for more than 100 years. The sampling

Table 6. Costs of the Sites 76 and 86 Alternatives

Cost in 2007 dollars	Alternative 1	Alternative 2	Alternative 3	Alternative 4 a	Alternative 4 b
Timeframe	NA	100 years	5 years	6 years	6 years
Site 76					
Capital	$0	$33,700	$848,000	$683,000	$450,000
LUCs/LTM	-	$4,120,000	$182,000	$201,000	$182,000
Operation and Maintenance	-	-	$214,000	$223,000	$94,600
Escalated Cost(1)	$0	$9,940,000	$1,300,000	$1,170,000	$770,000
Present Value Cost(2)	$0	$908,000	$1,250,000	$1,070,000	$705,000
Site 86					
Capital	$0	$33,700	$1,480,000	$1,450,000	$819,000
LUCs/LTM	-	$4,120,000	$396,000	$287,000	$215,000
Operation and Maintenance	-	-	$280,000	$223,000	$94,600
Escalated Cost(1)	$0	$9,940,000	$2,250,000	$2,070,000	$1,190,000
Present Value Cost(2)	$0	$908,000	$2,170,000	$1,900,000	$1,100,000

Notes:
(1) Escalated cost is the inflationary adjustment from current dollars to the future estimated cost when the work is performed.
(2) Present value is the amount of money that would need to be invested in the present to cover the total cost of the project, assuming an interest rate of 7 percent.
LTM Long-term monitoring
LUCs Land use controls

As recommended by the U.S. EPA, cost estimates for each alternative are to be within an accuracy range of -30 to 50 percent. The complete cost estimates can be found in the OU2 Feasibility Study.

would need to continue over this long period of time because the contaminants do not appear to be degrading naturally. This alternative would cost an estimated $10 million over 100 years at each site (Table 6).

3. Active Groundwater Restoration (Ex Situ Treatment). In this alternative, the groundwater would be pumped from the aquifer, treated with granular activated carbon, and then re-injected into the aquifer. The Air Force would maintain LUCs during treatment to make sure that people do not use the groundwater before it is cleaned. At Site 76, this alternative would require four extraction and two injection wells, and five years to clean the groundwater at an estimated cost of $1.3 million. At Site 86, this alternative would require 16 extraction and eight injection wells, and five years to clean the groundwater at an estimated cost of $2.3 million (Table 6).

4. Groundwater Restoration (In Situ Treatment) (Preferred Alternative). In situ methods clean up the groundwater while it is still in the ground, rather than pumping it out to clean it. The Air Force looked at several different in situ methods to clean up the groundwater at Sites 76 and 86. One method would be to inject a food source into the groundwater to stimulate the bacteria that are already present to degrade TCE to non-toxic end-products such as ethene (this method is known as **anaerobic biological degradation**, because the bacteria grow in the absence of oxygen).

Another method would be to inject chemicals into the groundwater to destroy the contaminants through the previously described method known as ISCO. As with Sites 5 and 14, the proposed chemicals would only destroy solvents such as TCE; there are no fuel contaminants present at Sites 76 and 86.

The Air Force would maintain LUCs at the sites to make sure that people do not use the groundwater before it is cleaned.

The Air Force considered these two methods to be sub-alternatives:

a) Anaerobic Biological Degradation. This sub-alternative would require approximately 16 wells and six years to clean up the plume at Site 76, at an estimated cost of $1.2 million, and approximately 45 wells and six years to clean up the plume at Site 86, at an estimated cost of $2.1 million (Table 6).

b) In Situ Chemical Oxidation. At Site 76, this sub-alternative would require approximately eight wells and six years to clean up the plume, at an estimated cost of $0.8 million. At Site 86, this sub-alternative would require approximately 21 wells and six years to clean up the plume, at an estimated cost of $1.2 million (Table 6).

Comparing the Alternatives to Cleanup Requirements

The four alternatives and two sub-alternatives previously mentioned are compared against the nine criteria established by the U.S. EPA (see Table 1) as described in Table 4.

Alternative 4 is Preferred

Based on an evaluation of the remedial alternatives against the nine criteria listed in Table 1, Alternative 4, Groundwater Restoration (In Situ Treatment) is preferred as the proper course of action to address the groundwater contamination at Sites 76 and 86. The alternative is preferred because it is the lowest cost alternative that will clean the entire plume.

The Air Force is conducting pilot tests to evaluate which in situ chemical and biological treatments (including aerobic biological degradation, which was considered in the Feasibility Study for Sites 5/14, but not for Sites 76 and 86) work best in the groundwater aquifer underlying OU2. Based on the results of these tests, the most cost effective treatment for the groundwater at Sites 76 and 86 will be selected. If none of the in situ treatments prove effective, other remedial options will be evaluated. Because this remedy will result in contaminants remaining on-site at levels above unrestricted use levels, LUCs will remain in place and five-year reviews will be performed until such time as contaminants are reduced to unrestricted use levels.

SITES WITH DEBRIS

Site 29

Site Background – Where the Contamination is and How it Got There

Site 29, South Base Abandoned Sanitary Landfill, is located approximately 1.5 miles south of the western end of South Base Active Runway 06/24 and east of the former Sewage Treatment Facility (Building 190). The site covers approximately 35 acres and consists of two former landfill areas (Figure 6). The older, western landfill area encompasses approximately 3 acres and was active in the late 1930s. In the mid-1950s, an eastern landfill encompassing approximately 20 acres was opened at Site 29. Waste was deposited in the eastern landfill area for 20 years until the 1970s. Household and industrial wastes, construction rubble (mainly concrete and asphalt), and asbestos-containing materials were deposited in the landfill. There are anecdotal reports that the landfill may contain unexploded ordnance. More recently, in 1985, construction rubble from the demolition of parts of South Base was placed on the surface of the landfill.

Site Characteristics

The Air Force was concerned that contamination may be leaking from the landfill into the soil, groundwater, and air. Workers drilled into the ground to collect landfill gas, and surface and subsurface soil samples. Hand auger samples were collected at the landfill surface. Deep samples were collected in conjunction with well installation surrounding the landfill.

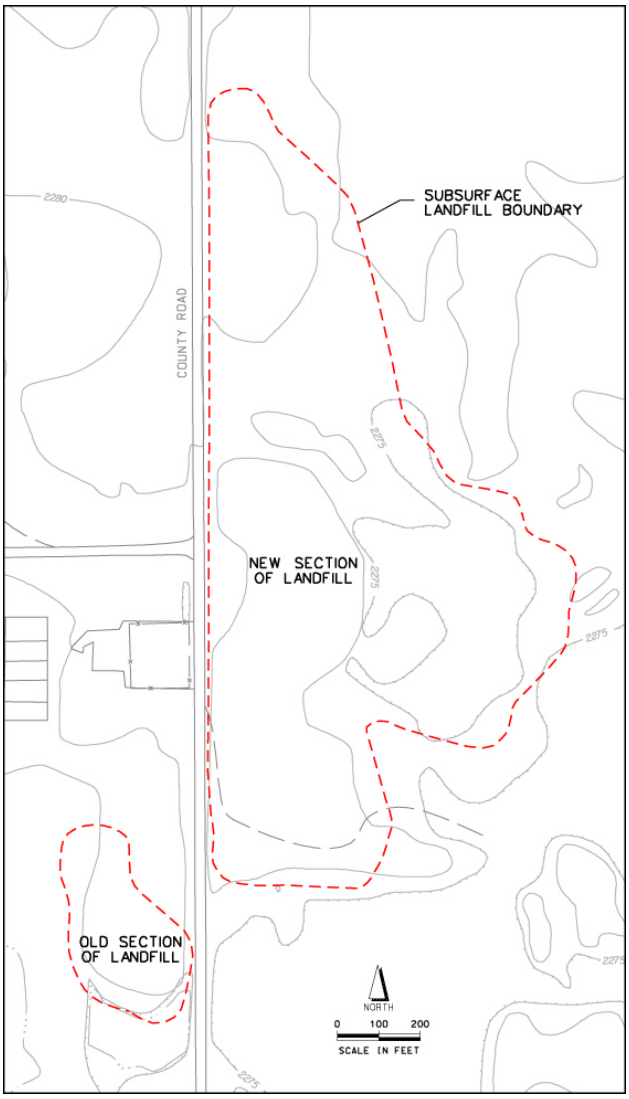

Figure 6. Site 29

Groundwater samples were collected from the monitoring wells. These samples were sent to off-Base laboratories to determine what chemicals were present. No samples were collected of the waste within the landfill. The findings of the Remedial Investigation are available for review in the Operable Unit 2 Remedial Investigation Summary Report located at the Information Repositories listed at the end of this document.

Soil

Low levels of fuels, solvents, and pesticides were detected in surface and shallow soil samples collected at Site 29; however, only arsenic, cadmium, iron, and lead were detected at concentrations above the residential PRGs and the background concentrations calculated for OU2 (Table 7). It was calculated, based on Regional Water Quality Control Board (RWQCB) – Central Valley Region total designated levels, that none of the contaminants in the soil samples collected at the abandoned landfill were detected at concentrations that could threaten the groundwater.

Groundwater

Very low concentrations of **organic compounds** including fuels, solvents, a pesticide, and an herbicide were sporadically detected in the groundwater samples collected at Site 29. TCE was the only organic compound detected at concentrations exceeding its MCL. This only occurred at a well that intercepted groundwater in a shallow, **perched aquifer** that occurs at a depth of approximately 30 feet below ground surface. The perched aquifer is not connected to the drinking water aquifer, which occurs at a depth of approximately 100 feet below ground surface. Since May 2002, there have been no detections of TCE (or any other organic compounds) above the MCL. Currently, only chromium and nickel are detected in the groundwater at concentrations above the MCLs and the calculated background concentrations for OU2. These high levels were detected in the shallow perched aquifer, which is not a potential source of drinking water due to low yield.

What the Air Force Has Already Done to Clean the Site and Protect Groundwater

The Air Force has already performed cleanup at Site 29 to remove some of the contamination. Because sampling results indicated that contaminants are present in the surface soil, and at one time were present in the shallow, perched aquifer, at concentrations exceeding regulatory guidelines, interim removal alternatives were evaluated in an engineering evaluation/cost analysis in 1997. Based on the results of this analysis, the recommended interim removal action was to conduct groundwater monitoring

Table 7. Contaminants of Concern in the Soil at Site 29

Contaminant	Highest Level Detected (mg/kg)	Residential PRGs (mg/kg)	Background Level at OU2 (mg/kg)	Cancer Causing?
Arsenic	32.5	0.39	22.7	Probable
Cadmium	18.6	9[(a)]	0.5	Probable
Iron	146,000	23,000	36,100	No
Lead	784	400	28.2	Probable

Notes:
[(a)] CAL-Modified Residential PRG.

This table shows the contaminants that were detected in the soil at Site 29 at levels greater than the Residential PRGs and the background levels at OU2. Residential PRGs are established by the U.S. EPA and based on the risk they pose to human health and the environment.

The symbol mg/kg means milligrams per kilogram, which is approximately the same as parts per million.

to provide early warning of a chemical release from the landfill contents to groundwater before it contaminated Base water supply wells, and to install an eight-foot high chain-link fence along the boundaries of the landfill to prevent unauthorized dumping and limit site access. Additionally, it was determined that asbestos-containing material should be removed from the landfill surface for proper disposal.

The fence was installed in 1998, and the long-term monitoring program was instituted. Additionally, a total of 15 cubic yards of friable (meaning the material is able to be crushed into a powder by hand) asbestos-containing material and 645 cubic yards of non-friable asbestos-containing material were removed from the site. The material was either placed in bags or lined bins (depending on the size of the item), and transported to an off-site landfill permitted to accept inert wastes including asbestos-containing materials.

Summary of Site Risks

Human Health Risk

A very conservative (i.e., health-protective) risk assessment was conducted that hypothetically assumed people would be living and/or working at Site 29 in the future. These people would potentially be exposed to the contaminants in the soil and groundwater through ingestion, inhalation, or skin contact. The residential risk assessment was performed for comparative purposes only, because it is unlikely that the site will ever be designated for residential use.

The cancer risk for hypothetical future residents exposed to the soil at Site 29 is calculated at $9x10^{-5}$, or about nine additional cancer cases for 100,000 people exposed, which is considered generally acceptable. The noncancer Hazard Index for hypothetical future residents at Site 29 is 9.7, which is considered unacceptable.

The cancer risk for industrial workers exposed to the soil at Site 29 is calculated at $1x10^{-5}$, or about one additional cancer case for 100,000 people exposed, which is considered generally acceptable. The noncancer Hazard Index for industrial workers at Site 29 is 3.0, which is considered unacceptable. However, the cancer risk and the noncancer Hazard Index may be overstated because the calculations used the maximum concentrations of arsenic, cadmium, iron, and lead detected in the soil at Site 29, which are restricted to small, isolated areas that may not be representative of the entire site.

The cancer risk for hypothetical future residents exposed to the groundwater at Site 29 is calculated at $1x10^{-5}$, or about one additional cancer case for 100,000 people exposed, which is considered generally acceptable. The noncancer Hazard Index for hypothetical future residents at Site 29 is 0.62, which is considered

acceptable. The cancer or noncancer risk to industrial workers from the groundwater at Site 29 was not calculated. Workers are unlikely to come in contact with groundwater.

Ecological Risk

Technical experts completed an ecological risk assessment at Site 29 and concluded that there could be potential risk to some plants and animals that live at or use the site. This conclusion was largely driven by detections of cadmium, lead, and zinc in nine to 12 percent of the soil samples that exceeded naturally occurring "background" concentrations. The risk assessors determined, however, that the contaminants are restricted to isolated, small areas, and that there was no consistent and substantial risk from the contaminants to the plant and animal communities as a whole.

Cleanup Goals

It is the Air Force's current judgment that the Preferred Alternative identified in this PP, or one of the other active measures considered in this PP, is necessary to protect public health or welfare and the environment.

Contaminants present at Site 29 do not pose a risk by either direct contact to soils or drinking the groundwater. However, buried waste is present at the site and some of the waste may not be inert. Therefore, the potential still exists for a release to groundwater when the buried wastes decompose. For this reason, there is a potential threat of a release of hazardous substances, and a remedial action is required under CERCLA.

The RAOs for Site 29 include:

- Protection of human health and the environment from an unacceptable exposure to landfill contents
- Keeping contaminants that could be present in the landfill wastes from migrating into the deep drinking water aquifer.

Portions of the **California Code of Regulations (CCR)** Title 27 that apply to the closure and post closure monitoring of non-hazardous waste management units are considered relevant and appropriate cleanup goals for Site 29. Units that were closed, abandoned, or inactive (CAI) before November 27, 1984 (CAI Units) may not need to meet all of the Closure and Post-Closure Maintenance requirements of CCR, Title 27.

Summary of Remedial Alternatives

The U.S. EPA encourages the use of "presumptive remedies" or standard approaches to site cleanup. Containment (prevention of migration of contaminants by physical means and LUCs) is the presumptive remedy for landfills. The U.S. EPA recognizes that it is not practical to treat all of the waste buried in a landfill.

Based on this presumptive remedy approach, the cleanup team looked at different alternatives for containment of wastes at Site 29, and compared each alternative against the previously described nine criteria detailed in Table 1. Alternative 3, which includes Removal of Recently Emplaced Surface Debris, LUCs, Stormwater Controls, and Long-term Monitoring, is preferred. The OU2 Feasibility Study, completed in August 2005, provides more detail.

The four possible alternatives are:

1. No Action. This alternative is listed only to compare to other alternatives. Existing fences surrounding both the old and new sections of the landfill currently provide access control. The fences are 8 feet high, and topped with three strands of barbed wire. Signs are posted on the perimeter fences, and there are locks on the landfill gates. This alternative assumes that no further actions (including maintenance of the fence and groundwater monitoring) will be taken at Site 29. This alternative has no cost (Table 8).

2. Land Use Controls, Stormwater Controls, and Long-term Monitoring. This alternative includes the implementation of LUCs and long-term monitoring. Existing stormwater drainage

Table 8. Costs of the Site 29 Alternatives

Cost in 2007 dollars	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Timeframe	NA	30 years	30 years	30 years
Capital	$0	$283,000	$2,320,000	$8,650,000
LUCs/LTM	-	$1,460,000	$1,460,000	$1,460,000
Operation and Maintenance	-	-	-	-
Escalated Cost[(1)]	$0	$2,330,000	$4,430,000	$11,000,000
Present Value Cost[(2)]	$0	$1,100,000	$3,200,000	$9,740,000

Notes:
(1) Escalated cost is the inflationary adjustment from current dollars to the future estimated cost when the work is performed.
(2) Present value is the amount of money that would need to be invested in the present to cover the total cost of the project, assuming an interest rate of 7 percent.
LTM Long-term monitoring
LUCs Land use controls

As recommended by the U.S. EPA, cost estimates for each alternative are to be within an accuracy range of –30 to +50 percent. The complete cost estimates can be found in the OU2 Feasibility Study.

channels would be improved and maintained to limit **infiltration** of water into the landfill.

There is currently little evidence water has infiltrated into the waste or that the groundwater has been impacted. Access controls currently in place would be improved by construction of a subsurface fence to prevent access by burrowing animals, concrete dams at gates, and clearing of vegetation outside the fence. The LUCs would be implemented to minimize the potential for human exposure to physical hazards, limit unauthorized dumping, ensure access for monitoring and maintenance, and protect the monitoring wells. Specific LUCs would include a) restrictions on intrusive activities that would cause disruption of landfill contents thus resulting in unacceptable exposure to landfill contents and/or residual contaminants, b) restrictions on development over the landfill surface and within a buffer zone to prevent risk of exposure, and c) restrictions preventing installation of drinking water wells over the landfill and within a buffer zone to limit drawdown from drinking water wells in the vicinity of the landfill. The footprint of the buffer zones would be developed as part of a detailed Remedial Design. Procedures for maintenance, monitoring, implementation, and enforcement of LUCs to ensure effective prevention of unacceptable human exposure for as long the landfill contents remain in place would be documented in the Base General Plan. Maintenance of the proposed access controls and groundwater monitoring wells is also included in this alternative. Long-term monitoring would be conducted at four monitoring wells at a frequency of once every two years. The long-term monitoring program was agreed to by the Remedial Project Managers (RPMs) on April 29, 2004. This alternative would cost an estimated $2.3 million over 30 years (Table 8).

3. Removal of Recently Emplaced Surface Debris, Land Use Controls, Stormwater Controls, and Long-term Monitoring (Preferred Alternative). This alternative includes all of the provisions of Alternative 2, with the addition that all of the recently emplaced surface debris located above the surface of the closed landfill would be removed from the site. The concrete debris at the site would be crushed and stockpiled near the site for later use as road base. Metal debris (primarily pipes and rebar) and asphalt would be trucked to a recycling center. Non-recyclable debris would be sent to a landfill. The existing cover would be maintained to prevent exposure of the buried debris by erosion. This alternative would cost an estimated $4.4 million over 30 years (Table 8).

4. Engineered Landfill Cover Constructed with On-Base Borrow Soil, Land Use Controls, and Long-term Monitoring. This alternative includes all the provisions of

Alternative 2, with the addition of construction of an engineered landfill cover. The engineered landfill cover design includes a one-foot thick foundation layer derived from crushing the existing concrete and asphalt surface debris, and a four-foot thick cover consisting of soil from elsewhere on the Base. Additionally, vegetation would be planted on the soil cover to prevent moisture from entering the landfill. This alternative would cost an estimated $11 million over 30 years (Table 8).

Comparing the Alternatives to Cleanup Requirements

The Air Force evaluates nine criteria established by the U.S. EPA when choosing a way to clean up a contaminated site. The four alternatives previously mentioned are compared against the nine criteria in Table 9.

Alternative 3 is Preferred

Based on an evaluation of the remedial alternatives against the nine criteria listed in Table 1, Alternative 3, Removal of Recently Emplaced Surface Debris, Land Use Controls, Stormwater Controls, and Long-term Monitoring is preferred as the proper course of action to address the debris present at Site 29. The alternative is preferred because it is the lowest cost alternative that is protective of human health and the environment, and is compliant with ARARs. Because this alternative will result in contaminants remaining on site at levels above unrestricted use levels, LUCs will remain in place and five-year reviews will be performed to ensure the remedy continues to be protective of human health and the environment.

Site 69

Site Background – Where the Contamination is and How it Got There

Site 69, Old South Base North Landfill, is located in the Cantonment Area approximately 1,000 feet north of Main Base Active Runway 04/22, and encompasses approximately 28 acres (Figure 7). The site was thought to be used by the Air Force from the early 1940s to the mid 1950s, though some homestead debris may be older. Waste is deposited in scattered pits throughout the site. The surface of the site is currently covered with scattered rusted cans, broken glass, metal wire, and railroad debris.

Site Characteristics

The Air Force conducted a geophysical survey at Site 69 to map the extent of the buried wastes. Four areas, encompassing approximately 0.9 acres, were identified by the survey as places where wastes could be buried. Ten test pits were excavated in these areas in 1995 and verified the presence of debris. Soil samples were also collected and sent to off-Base laboratories to identify what chemicals were present. Based on the results of the geophysical survey and test pit sampling, the estimated volume of waste is 8,000 cubic yards. The debris consists primarily of homestead artifacts including glass jars and bottles, wood chips, burnt metal, twisted wire, porcelain fragments, charcoal, rubber cable, bricks, burnt piping, nails, and fencing materials. The findings of the Remedial Investigation are available for review in the Operable Unit 2 Remedial Investigation Summary Report located at the Information Repositories listed at the end of this document.

Low levels of organic compounds (including fuel and solvent constituents, pesticides, and **polychlorinated biphenyls [PCBs]**), metals, and other elements were detected in the surface and subsurface soil samples collected at Site 69. Contaminants detected at concentrations above the residential PRGs and the calculated background levels for OU2 are shown on Table 10. Calculations based on RWQCB – Central Valley Region total designated levels indicated that none of these contaminants were detected in the soil samples at concentrations that could threaten the groundwater, which occurs at a depth of approximately 50 feet below ground surface.

Table 9. Evaluation of Alternatives for the Debris Sites

KEY

○ Does not meet criteria
◒ Partially meets criteria
● Meets Criteria

Evaluation Criteria	Overall protection of human health and the environment	Compliance with ARARs	Long-term effectiveness and permanence	Reduction of toxicity, mobility, or volume through treatment	Short-term effectiveness	Implementability	Cost	State/Support Agency acceptance	Community acceptance
Site 29 Alternatives									
1. No Action	○	○	◒	○	●	●	●	○	TBD
2. LUCs, Stormwater Controls, and LTM	●	◒	●	●	●	●	●	○	TBD
3. Removal of Recently Emplaced Surface Debris, LUCs, Stormwater Controls, and LTM (Preferred Alternative)	●	●	●	●	●	●	●	●	TBD
4. Engineered Landfill Cover with On-Base Borrow Soil, LUCs, and LTM	●	●	●	●	●	◒	◒	●	TBD
Site 69 Alternatives									
1. No Action	○	○	○	○	○	●	●	○	TBD
2. LUCs	●	○	●	○	●	●	●	◒	TBD
3. Removal and On-Base Waste Disposal (Consolidation at Site 29)	●	●	●	●	●	●	◒	●	TBD
4. Removal and On-Base Waste Disposal (Consolidation at the Main Base Active Landfill) (Preferred Alternative)	●	●	●	●	●	●	◒	●	TBD
Sites 81 and 102 Alternatives									
1. No Action	○	○	○	◒	○	●	●	○	TBD
2. Removal and On-Base Waste Disposal (Consolidation at Site 29)	◒	●	●	●	◒	●	◒	◒	TBD
3. Removal and Off-Site Treatment or Recycling (Preferred Alternative)	●	●	●	●	●	●	◒	●	TBD

Notes:
LUCs Land use controls
LTM Long-term monitoring
TBD to be determined, community acceptance will be assessed at the end of the public review and comment period

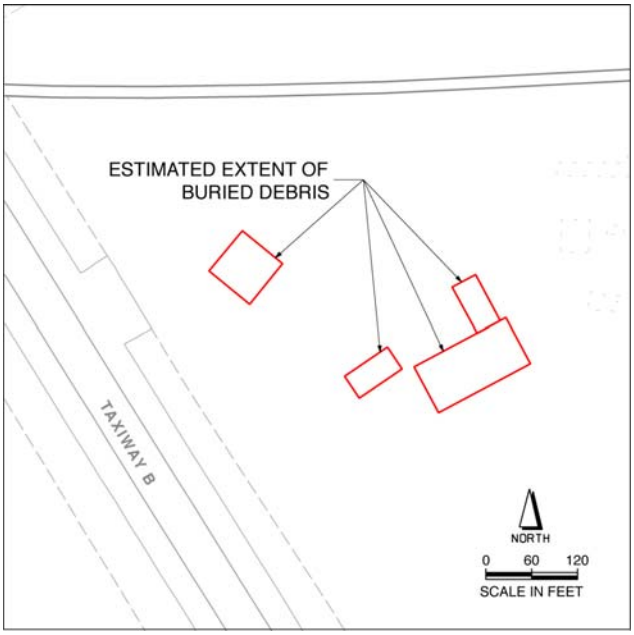

Figure 7. Site 69

Summary of Site Risks

Human Health Risk

A very conservative (i.e., health-protective) risk assessment was conducted that hypothetically assumed people would be living and/or working at Site 69 in the future. These people would potentially be exposed to the contaminants in the soil through ingestion, inhalation, or skin contact.

The cancer risk for hypothetical future residents exposed to the soil at Site 69 is calculated at $8x10^{-6}$, or eight additional cancer cases for one million people exposed, which is considered generally acceptable. The Hazard Index for hypothetical future residents exposed to the soil at Site 69 is 9.5, which is considered unacceptable. The Hazard Index, however, may be overstated. The constituents that accounted for the majority of the noncarcinogenic risk (antimony and manganese) only exceeded residential PRGs in one of 15 samples.

The cancer risk for industrial workers exposed to the soil at Site 69 is calculated at $1x10^{-6}$, or one additional cancer case for one million people exposed, which is considered acceptable. The Hazard Index for industrial workers exposed to the soil at Site 69 is 0.64, which is considered acceptable.

Ecological Risk

Technical experts completed an ecological risk assessment at Site 69 and determined the potential risk to some types of wildlife might be significant because the habitat at Site 69 is attractive to certain types of wildlife, and because of the potentially slow rate of habitat recovery. The risk assessors

Table 10. Contaminants of Concern in the Soil at Site 69

Contaminant	Highest Level Detected (mg/kg)	Residential PRGs (mg/kg)	Background Level at OU2 (mg/kg)	Cancer Causing?
Metals and Other Elements				
Antimony	141	31	6	No
Cadmium	11	9[(a)]	0.5	Probable
Manganese	8,150	1,800	905	No
Pesticides				
Dichlorodiphenyldichloroethylene (4,4'-DDE)	5.8	1.7	NA	Probable
Dichlorodiphenyltrichloroethane (4,4'-DDT)	4.4	1.7	NA	Probable

Notes:
(a) CAL-Modified Residential PRG.
NA Not Applicable

This table shows the contaminants that were detected in the soil at Site 69 at levels greater than the Residential PRGs and the background levels at OU2. Residential PRGs are established by the U.S. EPA and based on the risk they pose to human health and the environment.

The symbol mg/kg means milligrams per kilogram, which is approximately the same as parts per million.

determined, however, that the contaminants are isolated to a single area, and that there was no consistent and substantial risk from the contaminants to the plant and animal communities as a whole.

Cleanup Goals

It is the Air Force's current judgment that the Preferred Alternative identified in this PP, or one of the other active measures considered in this PP, is necessary to protect public health or welfare and the environment.

The cleanup team has proposed one RAO for Site 69:

- Prevent people or animals from direct contact with buried and surface debris

The goal for Site 69 is to remove buried and surface debris from the site.

Portions of CCR Title 27 that apply to the closure and post closure monitoring of non-hazardous waste management units are considered relevant and appropriate cleanup goals for Site 69. Units that are clean-closed (all wastes and contaminated materials are physically removed from the site) are exempt from maintenance and monitoring requirements under CCR Title 27.

Summary of Remedial Alternatives

The cleanup team looked at different alternatives for cleaning up Site 69, and compared each alternative against the previously described nine criteria as detailed in Table 1. Alternative 4, Removal and On-Base Waste Disposal of the Buried and Surface Debris (Consolidation at the Main Base Active Landfill), is preferred. Due to the low volume of waste, the Air Force decided that containment of waste would not be cost effective. The OU2 Feasibility Study, completed in August 2005, provides more detail. The four possible alternatives are:

1. No Action. This alternative is listed only to compare to other alternatives. No monitoring or additional LUCs are assumed for this alternative. This alternative has no cost (Table 11).

2. Land Use Controls. This alternative includes the implementation of LUCs to restrict access and land use at Site 69. Fence

Table 11. Costs of the Site 69 Alternatives

Cost in 2007 dollars	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Timeframe	NA	1 year(1)	1 year	1 year
Capital	$0	-	$278,000	$280,000
LUCs	-	$19,000	-	-
Operation and Maintenance	-	-	-	-
Escalated Cost(2)	$0	$19,000	$278,000	$280,000
Present Value Cost(3)	$0	$19,000	$278,000	$280,000

Notes:

(1) The estimated cost is based on the implementation of LUCs over one year. Cost to maintain LUCs over time would be minimal compared to the total programmatic costs to maintain LUCs for all sites at Edwards AFB.

(2) Escalated cost is the inflationary adjustment from current dollars to the future estimated cost when the work is performed.

(3) Present value is the amount of money that would need to be invested in the present to cover the total cost of the project, assuming an interest rate of 7 percent.

LUCs Land use controls

As recommended by the U.S. EPA, cost estimates for each alternative are to be within an accuracy range of –30 to +50 percent. The complete cost estimates can be found in the OU2 Feasibility Study.

installation was not considered because the site is adjacent to a taxiway. LUCs would include land use restrictions for Site 69 in the Base General Plan to limit future possible land uses, as well as instructions and orders issued by the Commanding Officer of the Base to govern all conduct, actions, and activities with respect to the site. This alternative would cost an estimated $19,000 to implement the LUCs (Table 11). Cost to maintain LUCs over time would be minimal compared to the total programmatic costs to maintain LUCs for all sites at Edwards AFB.

3. Removal and On-Base Waste Disposal of the Buried and Surface Debris (Consolidation at Site 29). This alternative includes the excavation and removal of waste and stained soil (if encountered), on-Base debris consolidation, and clean closure of Site 69. Once the waste and stained soil is removed, recycling would be implemented for suitable waste, while the remainder of the waste and stained soil would be consolidated at Site 29, which would serve as a **corrective action management unit (CAMU)**. Waste and stained soil removal at the site would be visually verified to document clean closure; no soil sampling for chemical analysis is proposed in this alternative. This alternative would cost an estimated $0.3 million over one year. It should be noted that because this alternative is considered in conjunction with Alternative 4 for Site 29, the costs for implementing the landfill cover alternative must be considered as part of the estimated cost for this alternative (Table 8), but have not been included in the calculated cost of $0.3 million (Table 11).

4. Removal and On-Base Waste Disposal of the Buried and Surface Debris (Consolidation at the Main Base Active Landfill) (Preferred Alternative). This alternative is similar to Alternative 3, except that wastes and stained soil (if encountered and evaluated to be non-hazardous) that could not be recycled would be consolidated at the Main Base Active Landfill. The feasibility of this alternative may depend upon the available capacity at the Main Base Active Landfill, and their acceptance of the waste and stained soil removed from Site 69. If the Main Base Active Landfill cannot be utilized, an alternate off-Base disposal site would have to be identified, which would require additional expenditures. This alternative would cost an estimated $0.3 million over one year (Table 11).

Comparing the Alternatives to Cleanup Requirements

The four alternatives previously mentioned are compared against the nine criteria established by the U.S. EPA (refer to Table 1) as shown in Table 9.

Alternative 4 is Preferred

Based on an evaluation of the remedial alternatives against the nine criteria listed in Table 1, Alternative 4, Removal and On-Base Waste Disposal of the Buried and Surface Debris (Consolidation at the Main Base Active Landfill) is preferred as the proper course of action to address the debris present at Site 69. The alternative is preferred because it is the lowest cost alternative that is protective of human health and the environment, and compliant with ARARs.

Sites 81 and 102

Site Background – Where the Contamination is and How it Got There

Site 81, Old South Base Northern Skeet Range, is located in the Cantonment Area northwest of South Base Active Runway 06/24 and 600 feet southwest of Building 365 on an unnamed access road (Figure 8). The skeet range encompasses an area of approximately 3 acres, and was used in the 1940s and 1950s as a small arms/skeet range. Site 102, Old South Base Southern Skeet Range, is located south of South Base Active Runway 06/24 and 1,200 feet north of the southern end of Abandoned Runway 12/30 (Figure 9). The site consists of a 2-acre small arms/skeet range that was used in the 1940s. Lead shot pellets and black clay fragments of broken skeet targets are visible on both range surfaces.

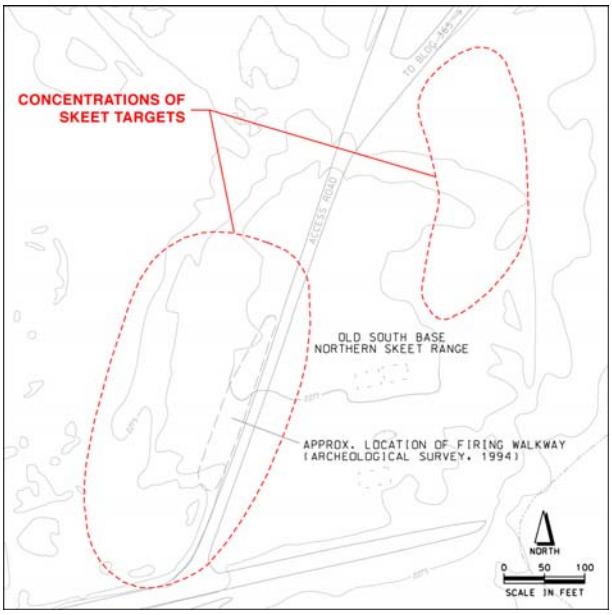

Figure 8. Site 81

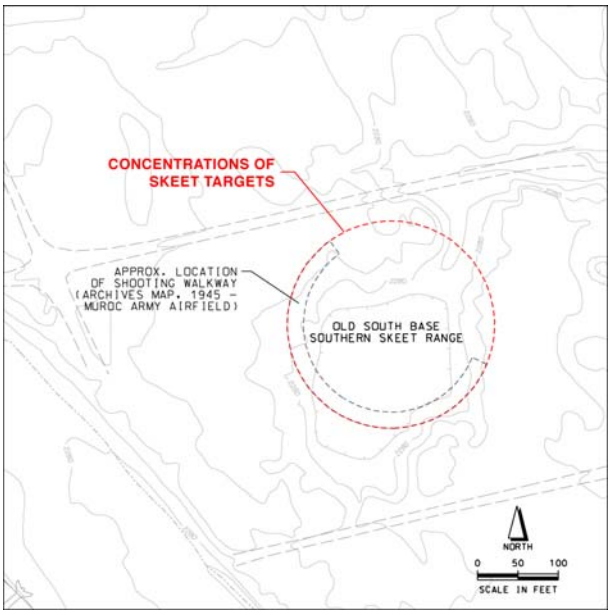

Figure 9. Site 102

Site Characteristics

Workers collected soil samples at the sites and sieved the samples for lead pellets to determine if the soils were contaminated from the lead shot. The skeet targets were sampled and analyzed for **polycyclic aromatic hydrocarbons (PAHs)**, which are carcinogenic chemicals formed by the incomplete burning of organic substances (such as coal or wood) and which are also found in the petroleum pitch used to make skeet targets during the World War II-era. The findings of the Remedial Investigation are available for review in the Operable Unit 2 Remedial Investigation Summary Report located at the Information Repositories listed at the end of this document.

The Air Force determined that only a few scattered lead pellets remain at the sites. Apparently the pellets were removed and the lead recycled while the ranges were in operation. Lead and other metals were detected at concentrations near or below background concentrations and thus are considered to be naturally occurring. The detection of arsenic as shown on Table 12 is only slightly above the calculated background concentration for OU2, and is likely to be naturally occurring.

PAHs were detected in the skeet target shards. The volume of skeet target shards remaining at Sites 81 and 102 is estimated at 2,400 cubic yards and 1,600 cubic yards, respectively. Calculations based on RWQCB – Central Valley Region total designated levels indicate none of the contaminants were detected in the soil samples and skeet target shards at concentrations that could threaten the groundwater, which occurs at depths of approximately 47 feet and 100 feet below ground surface at Sites 81 and 102, respectively.

Summary of Site Risks

Human Health Risk

A very conservative (i.e., health-protective) risk assessment was conducted that hypothetically assumed people would be living and/or working at Sites 81 and 102 in the future. The Air Force calculated the potential risk to human health if hypothetical future residents or industrial workers at Sites 81 and 102 are exposed to the contaminants (metals and other elements) in the soil through ingestion, inhalation, or skin contact.

Table 12. Contaminants of Concern in the Soil and Debris at Sites 81 and 102

Contaminant	Highest Level Detected (mg/kg)	Residential PRGs (mg/kg)	Background Level at OU2 (mg/kg)	Cancer Causing?
PAHs detected in Skeet Shards				
Benzo(a)anthracene	360	0.62	NA	Probable
Benzo(a)pyrene	190	0.062[(b)]	NA	Probable
Benzo(b)fluoranthene	180	0.62	NA	Probable
Benzo(k)fluoranthene	120	0.61[(b)]	NA	Probable
Chrysene	210	6.1[(b)]	NA	Probable
Indeno(1,2,3-cd)pyrene	66[(a)]	0.62	NA	Probable
Napthalene	110[(a)]	56	NA	Probable
Metals and Other Elements Detected in Soil				
Arsenic	24.1	0.39	22.7	Probable

Notes:
(a) Estimated quantity.
(b) CAL-Modified Residential PRGs.
NA Not Applicable
PAHs Polycyclic Aromatic Hydrocarbons

This table shows the contaminants that were detected in the skeet shards and soil at Sites 81 and 102 at levels greater than Residential PRGs and the background levels at OU2. Residential PRGs are established by the U.S. EPA and based on the risk they pose to human health and the environment.

Polycyclic Aromatic Hydrocarbons (PAHs) are chemicals formed by the incomplete burning of organic substances, such as coal or wood, and are found in the petroleum pitch used to make skeet during the World War II-era.

The symbol mg/kg means milligrams per kilogram, which is approximately the same as parts per million.

The cancer risk for hypothetical future residents at Site 81 was calculated at $2x10^{-7}$, or about two additional cancer cases for ten million people exposed, which is considered acceptable. The cancer risk for hypothetical future residents at Site 102 was calculated at $6x10^{-5}$, or about six additional cancer cases for 100,000 people exposed, which is considered generally acceptable.

The Hazard Indices for hypothetical future residents at Sites 81 and 102 are 0.38 and 0.43, respectively, which are considered acceptable.

No measurable cancer risk was calculated for industrial workers at Site 81. The cancer risk for industrial workers at Site 102 was calculated at $9x10^{-6}$, or about nine additional cancer cases for one million people exposed, which is considered generally acceptable.

The Hazard Indices for industrial workers at Sites 81 and 102 are 0.095 and 0.011, respectively, which are considered acceptable.

It should be noted that the risk assessments did not include the risk from exposure to PAHs by humans who come in contact with the skeet target shards. The skeet shards are being removed based on ecological risk (see below).

Ecological Risk

Technical experts completed ecological risk assessments at Sites 81 and 102. Lead was the only contaminant present in the soil at Site 81 that posed a potential risk to wildlife and habitat; however, the risk was considered minimal because lead was detected above the calculated background concentration for OU2 in only a single sampling location. No risk to plants or

animals was identified at Site 102. Although not part of the formal risk assessment, PAHs were detected in the skeet target shards, and could be a potential risk to wildlife.

Cleanup Goals

It is the Air Force's current judgment that the Preferred Alternative identified in this PP, or one of the other active measures considered in this PP, is necessary to protect public health or welfare and the environment.

The cleanup team has proposed one RAO for Sites 81 and 102:

- Prevent potential receptors, especially animal receptors, from direct contact with skeet target fragments contaminated with PAHs.

The goal for Sites 81 and 102 is to remove all visible skeet target fragments from the sites.

Portions of CCR Title 27 that apply to the closure and post closure monitoring of non-hazardous waste management units are considered relevant and appropriate cleanup goals for Sites 81 and 102. Units that are clean-closed (all wastes and contaminated materials are physically removed from the site) are exempt from maintenance and monitoring requirements under CCR Title 27.

Summary of Remedial Alternatives

The cleanup team looked at different alternatives for cleaning up Sites 81 and 102, and compared each alternative against the previously described nine criteria detailed in Table 1. Alternative 3, Removal and Off-Site Treatment or Recycling of the Skeet Target Fragments, is preferred. Due to the low volume and thin layer of waste, the Air Force decided that containment of waste would not be cost effective. The OU2 Feasibility Study, completed in August 2005, provides more detail. The three possible alternatives are:

1. No Action. This alternative is listed only to compare to other alternatives. No monitoring or additional LUCs are assumed for this alternative. This alternative has no cost (Table 13).

2. Removal and On-Base Waste Disposal of the Skeet Target Fragments (Consolidation at Site 29). This alternative includes the mechanical removal of the top six inches of soil containing skeet target debris (i.e., fragments) from Sites 81 and 102, and transport of the soil and debris to Site 29 for consolidation with other waste. The removal areas would then be revegetated with native plants. This alternative would cost an estimated $0.2 million over one year. It should be noted that because this alternative is considered in conjunction with Alternative 4 for Site 29, the

Table 13. Costs of the Sites 81 and 102 Alternatives

Cost in 2007 dollars	Alternative 1	Alternative 2	Alternative 3
Timeframe	NA	1 year	1 year
Capital	$0	$197,000	$251,000
Institutional Controls	-	-	-
Operation and Maintenance		-	-
Escalated Cost[(1)]	$0	$203,000	$259,000
Present Value Cost[(2)]	$0	$203,000	$259,000

Notes:
(1) Escalated cost is the inflationary adjustment from current dollars to the future estimated cost when the work is performed.
(2) Present value is the amount of money that would need to be invested in the present to cover the total cost of the project, assuming an interest rate of 7 percent.

As recommended by the U.S. EPA, cost estimates for each alternative are to be within an accuracy range of –30 to +50 percent. The complete cost estimates can be found in the OU2 Feasibility Study.

costs for implementing the landfill cover alternative must be considered as part of the estimated cost for this alternative, but have not been included in the calculated cost of $0.2 million (Table 13).

3. Removal and Off-Site Treatment or Recycling of the Skeet Target Fragments (Preferred Alternative). This alternative includes the manual removal of visible skeet target debris from Sites 81 and 102, and subsequent treatment or recycling at an off-Base facility. This alternative would cost an estimated $0.26 million over one year. There would be no further costs because the sites would be returned to unrestricted use (Table 13).

Comparing the Alternatives to Cleanup Requirements

The Air Force evaluates nine criteria established by the U.S. EPA when choosing a way to clean up a contaminated site. The three alternatives previously mentioned are compared against the nine criteria described in Table 9.

Alternative 3 is Preferred

Based on an evaluation of the remedial alternatives against the nine criteria listed in Table 1, Alternative 3, Removal and Off-site Treatment or Recycling of the Skeet Target Fragments is preferred as the proper course of action to address the skeet shards present at Sites 81 and 102. The alternative is preferred because of the lower overall cost when the cost for establishing a CAMU at Site 29 is considered, and because of the low potential for impact to the desert ecosystem.

SITES THAT REQUIRE NO FURTHER ACTION (CLEANUP ALREADY COMPLETED)

Sites 78 and 79

Site Background – Where the Contamination was and How it Got There

Site 78, Old South Base Vehicle Maintenance Area 2, and Site 79, Old South Base Vehicle Maintenance Area 1, are located northeast of South Base Active Runway 06/24 in the former South Base Cantonment Area. The sites encompass 0.83 and 5 acres, respectively. The two former vehicle maintenance areas consisted of a repair shop, grease and wash racks, sumps, a production well, and a motor gas underground storage tank.

Site Characteristics

Workers drilled into the ground to collect soil and groundwater samples. These samples were sent to off-Base laboratories to see what chemicals were present. Contamination at Sites 78 and 79 was limited to a total of six cubic yards of soil and debris in the concrete-lined grease pits. Contaminants included oil and grease, arsenic, and lead. The findings of the Remedial Investigation are available for review in the Operable Unit 2 Remedial Investigation Summary Report located at the Information Repositories listed at the end of this document.

What the Air Force Has Already Done to Clean the Sites and Protect Groundwater

The Air Force excavated and removed the contaminated soil and debris from the sites in 1997 for disposal at an off-site treatment facility. No cracks were found in the concrete lining of the grease pits; therefore, no soil samples were collected from under the grease pits. The grease pits were subsequently backfilled with clean soil.

The motor gas underground storage tank was never found, and may have been removed in the 1950s when the site was demolished.

Summary of Site Risks

Human Health Risk

After the cleanups were completed, a very conservative (i.e., health-protective) risk assessment was conducted that hypothetically assumed people would be living and/or working at Sites 78 and 79 in the future. These people

would potentially be exposed to the soil remaining on the sites through ingestion, inhalation, or skin contact.

The cancer risk for hypothetical future residents at Site 78 is calculated at $6x10^{-5}$, or about 6 additional cancer cases for 100,000 people exposed, which is considered generally acceptable. The cancer risk for hypothetical future residents at Site 79 is calculated at $7x10^{-5}$, or about seven additional cancer cases for 100,000 people exposed, which is considered generally acceptable.

The Hazard Index for hypothetical future residents at Site 78 is 0.32, which is considered acceptable. There is no noncancer risk to hypothetical future residents from chemicals at Site 79.

The cancer risks for industrial workers at Sites 78 and 79 are both calculated at $9x10^{-6}$, or about nine additional cancer cases for one million people exposed, which is considered generally acceptable.

The Hazard Index for industrial workers at Site 78 is 0.01, which is considered acceptable. There is no noncancer risk to industrial workers from chemicals at Site 79.

It should be noted that the calculated cancer risks are based solely on the maximum concentration of arsenic. At each site, arsenic was detected in only one of the soil samples collected, and the maximum concentrations were only slightly above the calculated background concentration for arsenic in soil at OU2. Therefore, the arsenic detected in the soil at these sites is considered to occur naturally, and the calculated cancer risks are likely overstated.

Ecological Risk

Technical experts completed ecological risk assessments at Sites 78 and 79 and determined that facility-related contaminants pose an acceptable level of risk to wildlife and habitat.

No Further Action for Soil and Groundwater

Sites 78 and 79 were approved by the RPMs for No Further Investigation on 30 June 1998.

The Air Force, U.S. EPA, and State of California, with the issuance of this Proposed Plan, agree that No Further Action for soil and groundwater are required for Sites 78 and 79 due to the low potential cancer and noncancer risks to human health, and that the sites should be approved for unrestricted use and unlimited exposure.

Site 96

Site Background – Where the Contamination was and How it Got There

Site 96, Old South Base Motor Pool, is located southwest of South Base Active Runway 06/24 in the southwest corner of the former South Base Cantonment Area, and encompasses 15 acres. The former motor pool was used by the Army Air Corps in the early 1940s to park and service vehicles. Prior to military use, the area was a homestead site and included a debris disposal area, a trash pit area, scattered refuse, and a burn area. The disposal and trash pit areas contained paint cans, grease cans, solvent cans, auto parts, an abandoned water well, and empty 55-gallon drums.

Site Characteristics

Workers drilled into the ground to collect soil samples. These samples were sent to off-Base laboratories to see what chemicals were present. Contamination at Site 96 was limited to surface and near surface soil (less than 3 feet below ground surface) and included low levels of organic contaminants such as petroleum products, TCE, pesticides (i.e., alpha-chlordane and gamma-chlordane), **dioxins**, and metals such as lead, cadmium, iron, and arsenic. The findings of the Remedial Investigation are available for review in the Operable Unit 2 Remedial Investigation Summary Report located at the Information Repositories listed at the end of this document.

What the Air Force Has Already Done to Clean the Site and Protect Groundwater

In 2000, the Air Force excavated the metals-contaminated soil at Site 96 to 2 feet below ground surface and stored the soil at the site. Confirmation soil samples from the bottom of the excavation confirmed that contaminants were detected below the industrial PRGs. Mixing the soil with cement and water stabilized the excavated soil, preventing it from acting as a future source of groundwater contamination, and produced a soil and cement slurry that was then used to backfill the excavation.

In 2002, the abandoned water well was destroyed and the well shaft sealed with cement grout, thereby protecting the groundwater from chemical contaminants possibly entering the well shaft from the ground surface.

Summary of Site Risks

Human Health Risk

After the cleanups were completed, a very conservative (i.e., health-protective) risk assessment was conducted that hypothetically assumed people would be living and/or working at Site 96 in the future. These people would potentially be exposed to the soil remaining on the site through ingestion, inhalation, or skin contact.

The risk for hypothetical future residents at Site 96 is calculated at $8x10^{-5}$, or about eight additional cancer cases for 100,000 people exposed, which is considered generally acceptable.

The Hazard Index for hypothetical future residents at Site 96 is 1.8, which is considered unacceptable.

The risk for industrial workers at Site 96 is calculated at $1x10^{-5}$, or about one additional cancer case for 100,000 people exposed, which is considered generally acceptable.

The Hazard Index for industrial workers at Site 96 is 0.38, which is considered acceptable.

Both the cancer risk and noncancer Hazard Index may be overstated for Site 96. The cancer risk is driven by a single detection of arsenic above the background concentration in the 17 soil samples collected. The noncancer Hazard Index is driven by a single detection of iron above the background concentration in the 17 soil samples collected. Both these detections occur in an isolated area that is not representative of the site as a whole.

Ecological Risk

Technical experts completed an ecological risk assessment at Site 96 and determined that the chemicals of potential ecological concern include metals, TCE, and dioxins. However, metals and dioxins were immobilized in 2000 during the earlier cleanup activities, and TCE was detected in only one soil sample and is not considered representative of Site 96. Therefore, there is an acceptable level of risk to wildlife and habitat.

No Further Action for Soil and Groundwater

Site 96 was approved by the RPMs for No Further Investigation on 21 June 2001.

The Air Force, U.S. EPA, and State of California, with the issuance of this Proposed Plan, agree that No Further Action is required for the soil and groundwater at Site 96 and that the site should be approved for unrestricted use and unlimited exposure. This decision is based on an estimated potential cancer risk within the acceptable range, a noncancer Hazard Index below 1 if the anomalous high concentration of iron is discounted, and the lack of a threat to groundwater.

Area of Concern 417

Site Background – Where the Contamination was and How it Got There

Area of Concern (AOC) 417, South Base Rocket Sled Track – Quarter Point Area, is located south of Rogers Dry Lake, straddles the South Base Sled Track, and encompasses 53 acres.

The sled track was completed in 1948 and was used through the 1950s. Facilities/buildings that supported sled track operations included a receiving station, an electronics laboratory, photo and supply shops; a fabrication shop; a suspected burn area and a pit containing drums and debris; a drainage channel containing several punctured 55-gallon drums; and a former underground storage tank.

Site Characteristics

Workers drilled into the ground to collect soil samples. Groundwater samples were collected from an existing on-site former Base water supply well. These samples were sent to off-Base laboratories to see what chemicals were present. The findings of the Remedial Investigation are available for review in the Operable Unit 2 Remedial Investigation Summary Report located at the Information Repositories listed at the end of this document.

Low levels of total petroleum hydrocarbons were detected in the soil samples collected from the pit containing drums and debris. Cadmium and iron were detected at levels exceeding the calculated background concentrations for OU2 and the residential PRGs. No organic contaminants were detected in the groundwater, and all detected inorganic constituents were below calculated background concentrations for OU2 and MCLs.

What the Air Force Has Already Done to Clean the Site and Protect Groundwater

In 1992, the underground storage tank was removed. The tank location was closed by the Kern County Environmental Health Services Department on 26 April 1993.

In 1997, the 55-gallon drums and debris were removed from the pit, and the low-level metal-impacted soil was mixed with cement and stabilized to prevent any future contamination of groundwater. The soil/cement slurry was backfilled into the pit. Confirmation soil samples from the excavation bottom confirmed that contaminants were detected below industrial PRGs. Metallic debris was sent to an on-Base recycling facility for later transport off Base. Non-hazardous refuse was sent to the Main Base Landfill. Additionally, the former Base water supply well was destroyed and the well shaft sealed with cement grout, thereby protecting the groundwater from chemical contaminants possibly entering the well shaft from the ground surface.

Summary of Site Risks

Human Health Risk

As part of the Remedial Investigation, the Air Force evaluated the potential risk to human health if future industrial workers are exposed to the residual soils at AOC 417 through ingestion, inhalation, or skin contact. However, the organic and inorganic substances detected in the soil samples did not exceed the calculated background concentrations for OU2; therefore, a cancer risk and noncancer Hazard Index were not calculated for the soils at AOC 417.

Organic substances were not detected in a groundwater sample collected from a former Base water supply well at AOC 417, and inorganic substances were not detected in the sample at concentrations exceeding the calculated background concentrations for OU2. However, the maximum concentration of nitrate was used in the risk assessment calculation because a background concentration for nitrate was not established. This resulted in an estimated noncancer Hazard Index of 0.02 for groundwater, which is considered acceptable.

Ecological Risk

Technical experts completed an ecological risk assessment at AOC 417 and determined that remaining contaminants pose no significant risk to potential ecological receptors in the area.

No Further Action for Soil and Groundwater

Area of Concern 417 was approved by the RPMs for No Further Investigation on 30 June 1998.

The Air Force, U.S. EPA, and State of California, with the issuance of this Proposed Plan, agree that No Further Action is required for the soil and groundwater at Area of Concern 417 and that the AOC should be approved for unrestricted use and unlimited exposure. This decision is due to the low potential for cancer and noncancer risks to human health and the lack of a threat to groundwater.

COMMUNITY PARTICIPATION

The Air Force provides information regarding the cleanup of South Base OU2 to the public through the Restoration Advisory Board, the Administrative Record File for the site, the Environmental Management website (http://www.edwards.af.mil/penvmng/aboutedwards/EM.html), and the monthly publication Report to Stakeholders.

The Air Force encourages the public to gain a more comprehensive understanding of OU2 and the cleanup activities that were conducted there. The documents that the Base has used to make decisions about the cleanup activities presented in this PP are included in the Administrative Record File for OU2. If you would like to view the Administrative Record File, you must make an appointment with Gary Hatch during regular business hours.

Address: 95 ABW/PAE
Attn: Mr. Gary Hatch
5 E. Popson Ave, Bldg. 2650A
Edwards AFB, CA 93524-8060

Phone: (661) 277-1454
Fax: (661) 277-6145
E-mail: gary.hatch@edwards.af.mil

Hours: By appointment only,
Monday through Friday
8 a.m. to 4:30 p.m.

TO MAKE A COMMENT

Comments can be made at public meetings or you may mail, e-mail, or fax your comments on the South Base OU2 Proposed Plan to Gary Hatch using the contact information above. A comment form is provided on page 43, but written comments may be in any form.

GLOSSARY

Aerobic biological degradation A natural process by which microbes decompose complex organic compounds in the presence of oxygen and use the liberated energy for reproduction and growth.

Administrative Record File A compendium of all documents relied upon to select an alternative for a remedial action.

Anaerobic biological degradation A natural process by which microorganisms in an oxygen-free environment reduce the energy level and change the chemical composition of organic matter.

Applicable or Relevant and Appropriate Requirements (ARARs) The Federal and State environmental laws, administrative regulations, and contaminant limits/standards that a selected remedy will meet unless waived by the lead agency. These requirements may vary among sites and alternatives.

Aquifer A particular zone or layer of rock or soil below the earth's surface through which groundwater moves in sufficient quantity to serve as a source of water.

Area of Concern (AOC) A particular area or site where military activities were conducted that is a responsibility of the Edwards Air Force Base Environmental Restoration Program.

Bioventing system Bioventing is a common form of in situ bioremediation for soils contaminated with fuels. Bioventing uses injection wells to pump air into the ground.

California Code of Regulations (CCR) Regulations that have been formally adopted by State agencies, reviewed and approved by the Office of Administrative Law, and filed with the Secretary of State. The CCR consists of 28 titles and contains the regulations of approximately 200 regulatory agencies.

Cantonment Area A developed land area used by the military, especially for the housing of troops and other military-related activities.

Code of Federal Regulations (CFR) The regulations published in the Federal Register by the executive departments and agencies of the Federal Government. It is divided into 50 titles that represent broad areas subject to Federal regulation. Most Federal environmental regulations are found in Title 40 of the CFR.

Comprehensive Environmental Response, Compensation, and Liability Act (CERLCA or Superfund statute) A Federal law that addresses the funding for and cleanup of abandoned or uncontrolled waste sites. This law establishes criteria for the creation of decision documents such as the Remedial Investigation, Feasibility Study, Proposed Plan, and **Record of Decision (ROD)**.

Contaminant plume A localized zone of contaminated groundwater that generally moves in the direction of (and with) groundwater flow.

Corrective Action Management Unit (CAMU) A special unit created under **RCRA** to facilitate treatment, storage, and disposal of hazardous wastes managed for implementing cleanup, and to remove the disincentives to cleanup that the application of RCRA to these wastes may sometimes impose.

Dioxins An aromatic compound; any of a group of chemical compounds that is an undesirable byproduct in the manufacture of herbicides, disinfectants, and other agents.

Dual Extraction System (DES) A system that pumps groundwater out of the aquifer exposing the contaminated soil. Soil contaminants are extracted by wells as vapors under a vacuum. At Site 5, free-product is separated from the extracted groundwater and sent to a recycling center. The groundwater is then cleaned by liquid-phase granular activated carbon. Soil vapors are cleaned by a catalytic oxidizer. The clean groundwater is pumped into the Base sewer system.

Ex situ In the context of groundwater treatment, ex situ means outside of the subsurface for treating groundwater (requires extraction) as opposed to remaining in the subsurface for treatment (i.e., in situ).

Extraction wells Wells used to pump groundwater and/or soil vapor to the surface for subsequent treatment or for use.

Feasibility Study One of two major studies that must be completed before a decision can be made about how to clean a site. The FS is prepared for regulatory review and details the development, screening, and evaluation of alternatives for the remediation of a contaminated site.

Federal Facility Agreement (FFA) A document, prepared and signed by the Air Force, U.S. EPA, and California regulators, that outlines the process to ensure that the Department of Defense (under the authority of the U.S. EPA) thoroughly investigates and takes cleanup actions concerning the releases of contaminants at Federal facilities to protect public health and the environment.

Free-product Petroleum hydrocarbons that remain undiluted as the original bulk liquids in the subsurface (e.g., spilled fuels or fuel/solvent mixtures).

Groundwater Underground water that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

Groundwater Extraction and Treatment System (GETS) A system that extracts groundwater and treats it aboveground. At Site 14, groundwater is extracted, pumped through granular activated carbon to remove the contaminant(s), and returned to the aquifer through injection wells.

Hazard Index The numerical expression of health effects from noncarcinogenic compounds. An index greater than "1" is considered detrimental.

In situ bioremediation In the context of groundwater treatment, in situ means remaining in the subsurface for treatment as opposed to extraction to the surface for treatment (i.e., ex situ). Bioremediation refers to treatment processes that use microorganisms such as bacteria, yeast, or fungi to break down hazardous substances into less toxic or nontoxic substances.

In situ chemical oxidation (ISCO) A treatment method that injects chemicals into the groundwater to destroy the contaminants.

Infiltration To cause (as a liquid) to permeate something by penetrating its pores or its interstices; to pass into or through (a substance) by filtering or permeating. When water "infiltrates" into a landfill, the water can leach contaminants, such as metals and chemicals, from the materials in the landfill. This now contaminated water, also called leachate, can then move down into the groundwater, carrying the contamination with it.

Land Use Controls (LUCs) Non-engineered mechanisms established to limit human exposure to contaminated waste, soil, or groundwater.

Long-term Monitoring The collection of information about the environment (i.e., usually groundwater sampling and analysis) that helps gauge the effectiveness of a cleanup action over a lengthy time period (i.e., usually over a span of years).

Maximum Contaminant Level (MCL) The maximum concentration, established by the U.S. EPA or the State of California, of a chemical that is allowed in public drinking water systems.

Monitoring Well A well drilled either on or near a hazardous waste site for the purpose of determining the direction of groundwater flow, types and concentrations of contaminants present, and vertical or horizontal extent of contamination.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) The Federal Government's plan for the response to oil spills and hazardous substance releases. The NCP has the force of Federal regulation.

National Priorities List (NPL) An information management tool that uses a Hazard Ranking System to identify and prioritize contaminated sites for investigation and cleanup.

Organic compounds Carbon-based compounds, such as solvents, oils, and pesticides. Most are not readily dissolved in water. Some organic compounds can cause cancer.

No Action The designation or action taken on a site categorized by at least one of the following characteristics: a site or operable unit that is already in a protective state or a site for which CERCLA can not provide the appropriate authority to take or complete remedial action.

Perched aquifer An aquifer that occurs above the water table. This occurs when there is an impermeable layer of rock or sediment perched above the main aquifer but below the ground surface. Water on the way down to the main aquifer gets trapped above this shallower impermeable layer.

Permanganate A dark purple crystalline compound known chiefly in purple-colored strongly oxidizing aqueous solutions.

Polycyclic aromatic hydrocarbons (PAHs) A group of chemicals formed by the incomplete burning of organic substances, such as coal or wood.

Pilot Test The testing of a cleanup technology under actual site conditions to identify potential problems prior to full-scale implementation.

Polychlorinated biphenyls (PCBs) A group of chemicals used as coolants and lubricants for electrical equipment until their production was banned in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects.

Preliminary Remediation Goals (PRGs) Tools for evaluating and cleaning up contaminated sites. PRGs are risk-based concentrations that are intended to assist risk assessors and others in initial screening-level evaluations of environmental measurements. PRGs are agency guidelines and are not legally enforceable standards.

Proposed Plan (PP) A document specifically prepared for public review and comment that summarizes the feasible remedial alternatives and the preferred remedial alternatives identified in the Feasibility Study.

Record of Decision (ROD) A document that records the final action, approved by the regulatory agencies, that is required at CERCLA and Superfund sites.

Remedial action objectives (RAOs) Cleanup action objectives for contaminants at sites that (1) are protective of both human health and the environment, (2) are cost effective, and (3) comply with identified, promulgated, and enforced ARARs, criteria, or limitations.

Remedial Investigation (RI) One of two major studies that must be completed before a decision may be made about how to clean a site. The RI builds on activities initiated during scoping and includes implementation of the work plan, the sampling and analysis plan, and the health and safety plan. Field data are collected and analyzed to determine the problems posed by a site and to support the identification of potential remedial actions.

Resource Conservation and Recovery Act (RCRA) The Federal law that establishes a regulatory system to track hazardous wastes from generation to final disposition. RCRA also provides for safe hazardous waste management practices and imposes standards for transporting, treating, storing, and disposing of hazardous waste.

Risk Assessment A qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific chemicals.

Superfund Created under CERCLA to fund the cleanup of sites that are not Department of Defense (DOD) sites.

Trichloroethene (TCE) A chlorinated volatile organic compound (i.e., an organic compound containing carbon and chlorine atoms that evaporates readily at room temperature). TCE is a nonflammable, colorless liquid with a sweet odor, and a sweet burning taste. It is used mainly as a solvent to remove grease from metal parts.

How to Get More Information

If you want more information on the underground contamination at South Base OU2, you may look at technical documents we have available for the public at four locations:

Edwards AFB Library
5 West Yeager Boulevard
Building 2665
Edwards AFB, CA 93524-1295
(661) 275-2665

Kern County Public Library
Wanda Kirk Branch
3611 West Rosamond Boulevard
Rosamond, CA 93560
(661) 256-3236

Los Angeles County Public Library
601 West Lancaster Boulevard
Lancaster, CA 93534
(661) 948-5029

Colonel Vernon P. Saxon Jr. Aerospace Museum
26922 Twenty Mule Team Road
Boron, CA 93516
(760) 762-6600

OR you may contact:

Nicole Moutoux, Remedial Project Manager
U.S. EPA
(415) 972-3012
moutoux.nicole@epa.gov

John Harris, Remedial Project Manager
DTSC
(916) 255-3683
jharris3@dtsc.ca.gov

Kai Dunn, Remedial Project Manager
CRWQCB, Lahontan Region
(760) 241-7365
kdunn@waterboards.ca.gov

We welcome your comments to the Edwards Air Force Base Proposed Plan for South Base Operable Unit 2

Public input regarding the Proposed Plan for Edwards Air Force Base South Base OU2 is important to the Air Force. Comments provided by the public are valuable in helping the Air Force select final cleanup remedies for the sites at South Base OU2. If you have any questions about the comment period, please contact Gary Hatch of Environmental Public Affairs @ (661) 277-1454.

Comments may also be submitted to the Air Force via e-mail at: gary.hatch@edwards.af.mil. Hard copy comments may be mailed to: 95 ABW/PAE, 5 East Popson Avenue, Building 2650A, Edwards AFB, California, 93524-8060, Attention: Gary Hatch. You may add additional pages to this form, as necessary. When you are finished, you may give your form to our staff or mail it.

Comments must be postmarked by October 2, 2006.

Name _____ Home Phone _____

Address _____ Work Phone _____

City _____ State _____ Zip _____

Comment or concern:

If you'd like to speak directly with someone about your concern, please contact Gary Hatch, Chief of Environmental Public Affairs, at (661) 277-1454.